# The Chemical Age

Weekly Journal Devoted to Industrial and Engineering Chemistry

VOL. XLVII No. 1215 SATURDAY, OCTOBER 10, 1942 REGISTERED AS A NEWSPAPER 6D. PER COPY POST FREE 8D.

## PRACTICAL RECOVERY

of

## **SOLVENTS**

lost in Vapour form

**INDUSTRIAL PROCESSES** 

by

## "ACTICARBONE"

methods

Acetone Ether Rubber solvent Alcohol Petrol Tri-chlor

etc.

Complete Plants designed and installed

PRICE STUTFIELD & CO. LTD.

110, FENCHURCH STREET, E. C. 3.

Tel: ROYAL 7011

'Grams: Exconsec. Fen. London

## An increasing Variety of IODIN

uses

For progressive manufacturers, the Iodine Educational Bureau offers ready access to the world's large and growing store of tested information on the manifold uses of iodine. No charge is made for information or advice on any iodine problem. Write for a copy of the bulletin "The Technics of Iodine."

IODINE EDUCATIONAL BUREAU 13, Stone House, Bishopsgate, London, E.C.2

" Everything for Safety Everywhere"



GAS MASKS -ALL TYPES Self-Contained

Breathing Apparatus

" Proto," " Salvus," etc. Short-Distance Breathing

Apparatus "Antipoys," and other types



OXYGEN and OXYGEN + CO.

Resuscitation Apparatus

and other types

DUST MASKS and GOGGLES et all patterns ASBESTOS FIREPROOF CLOTHING, ACIDPROOF GARMENTS, etc.

SIEBE, GORMAN & CO. LTD., LONDON
Telegrams:
Siebe, Lamb, London
Waterloo 6071



These drums are welded throughout and are manufactured in large quantities from British steel. They can be supplied painted, galvanised or tinned. Also manufactured in stainless steel, Capacities ranging from 20 to 150 gallons.



AINTREE, LIVERPOOL 10

Grams; Braby, Phone, Liverpool. 'Phone: Aintree 1721 (5 lines). Also at London, Deptford, Bristol, Plymouth, Glasgow, etc.

#### ROLLER

## **FILM DRIERS** FLAKERS & COOLERS

We offer the accumulated experience of 50 years' specialization.

OUR WORKS, the largest in the United Kingdom devoted especially to DRYING MACHINERY, are laid out and equipped with the latest plant for this particular purpose.

RICHARD SIMON & SONS LD. PHOENIX WORKS NOTTINGHAM



Oc

difference of the correction o

Oxloring arc-degraphoo description other

H Tel.



N these times, when plant renewals are difficult and even impossible, there is no necessity to let plant fall out of commission because of weakness or leakage due to corrosion or other damage. We can repair gas-holders while still in commission, and are adepts at welded repairs to all industrial and chemical equipment.

Oxley Metal Surgery has executed major and minor repairs to all classes of plant by unique arc-welding methods developed by us to a high degree of skill and ingenuity. Write for our book "Metal Surgery." Some of the repairs described therein are almost incredible-but they retained plant in service which would otherwise have had to be laid-off.



HUNSLET Tel. - 27468 (3 lines)

LEEDS 'Grams. " Oxbros, Leeds '

FOR SAMPLES and TECHNICAL INFORMATION .. PURE CRYSTAL OF UNVARYING COMPOSI ALUM SULPHATE OF ALUMINA ALUMINOFERRIC ::: **ACTIVATED ALUMINA** SODIUM ALUMINATE NEOSYL" REGD (AMORPHOUS SILICA UNIQUE LIGHTNESS & FINENESS TYPHOX" AND TITANIUM POTASSIUM OXALATE DEAL MORDANTS FOR LEATHER DYEING TITANOUS SULPHATE PETER SPENCE & SONS LTD NATIONAL BUILDINGS : MANCHESTER 3 NOON OFFICE: 4 HANGER GREEN . EALING . W.5

## **SAVE THOSE KEGS**



The utmost economy in containers of all kinds is essential.

Guelph casks can be used many times with perfect safety.

In the interests of national economy make the fullest use of all Guelph casks received into your works.

THE GUELPH CASK, VENEER & PLYWOOD CO., LTD.
West Ferry Rd., Millwall, London, E.14 Phone: East 1489
Also at Manchester, England; Scotstown, Quebec; and Mattawa, Ontario, Canada

### "POSTLIP"

### ENGLISH FILTER PAPERS

White Grey, Plain, Antique, Crinkled, and Embassed.



All sizes, Squares, Circles and Folded Filter Rolls made to order

**Pure Filterings for** Laboratory Work, and in quantities for all Industrial purposes.

See report of TESTS made by the National Physical Laboratory, a copy of which will be sent on application sent on application together with free samples if required.

Postlip Filterings are stocked by all the leading Wholesale Laboratory Dealers

EVANS ADLARD & Co., Ltd.

WINCHCOMBE, CHELTENHAM, ENGLAND

Specialising in

INDUSTRIAL CHEMICALS, SOLVENTS, PLASTICS, AND MATERIALS FOR MANU-FACTURING INDUSTRIES THROUGHOUT AUSTRALIA AND NEW ZEALAND.

Open to extend connections with

BRITISH MANUFACTURERS

Head Office: 26/30, Clarence Street, Sydney, N.S.W. and at Melbourne, Adelaide, Perth, Brisbane and Wellington N.Z.

Cable Address: SWIFT, SYDNEY Bankers: Bank of New South Wales, Sydney and London.

Descriptive B

CREPIN & DOUMIN LTD. 15, COOPER'S ROW, LONDON, E.C.3 Cables: Dovorian, Fen, London Tel.: Royal 2107

## SAVE OIL

OF THE IMPORTANCE FILTERING USED LUBRICATING OIL SO THAT IT MAY BE RE-USED IS MEASURED TO-DAY IN TERMS OF SHIPPING SPACE AND SEAMEN'S COURAGE. WE CAN SAVE OIL

WE MUST SAVE OIL

Before the war, 10,000 users had proved that a Stream-Line filter will save its cost many times over every year.

Technically and commercially the use of a Stream-Line filter by the actual oil user has always been right : -to-day it is vital.

#### LIMITATION OF SUPPLIES

All oil is nationally important, but for the time being filters can only be supplied to waers having batches of oil of known grade sufficient to justify the size selected and aving a direct use for the filtered oil.

Those unable to secure a filter at present should nevertheless save their oil. Arrangements for, its disposal will be advised on

GOOD OIL DOES NOT WEAR OUT

#### STREAM-LINE FILTERS LTO.

London, 8.W.8

## READS

Manufacture an unequalled range of

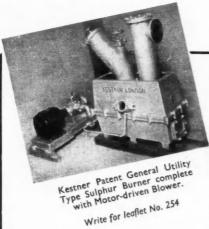
#### TINS, DRUMS, AND METAL CONTAINERS

FOR ALL TYPES OF COMMODITIES

If you are in difficulty over special requirements, we may be able to help you

### READS LTD.

BRIDGEWATER STREET 21 LIVERPOOL



## KESTNER SULPHUR BURNERS

for

High Sulphur dioxide concentration with freedom from sublimed sulphur.

Non-pressure 'type

No metal or moving parts in contact with burning sulphur or

gas. Continuous operation solid or liquid feed General Utility type Burners of any capa-

city supplied.

Complete installations for handling sulphur dioxide.

KESTNER EVAPORATOR & ENGINEERING Co. Ltd. Chemical Engineers - 5, GROSVENOR GARDENS, LONDON, S.W.I

# INTERMEDIATE PRODUCTS ANILINE DYES FAST BASES FOR ICE COLOURS

Benzol, Nitrobenzol, Binitrobenzol, Nitronaphthalene, Binitronaphthalene, Xylol, Nitroxylol, Binitroxylol, Xylidine. Toluol. Ortho & Para Nitrotoluol. Binitrotoluol. (All Grades)

Para Nitro Ortho Toluidine, Meta Nitro Para Toluidine
ORTHO TOLUIDINE PARA TOLUIDINE

Extensive Range of Oil Colours, Acid Colours, Basic Colours, Direct Colours, Pigment Colours,
Azoic Colours for Wool, also Colours suitable for all Trades
META TOLUYLENE DIAMINE META PHENYLENE DIAMINE

JOHN W. LEITCH & CO., LTD.

MILNSBRIDGE CHEMICAL WORKS

Telephone: 189-190 MILNSBRIDGE HUDDERSFIELD

Telegrams: LEITCH, MILNSBRIDGE

INDIA

Khatau Valabhdas & Co., Vadgadi, Bombay. SCOTLAND

Kirkpatrick & Lauder Ltd., 180, Hope Street, Glasgow, C.2 CANADA

Prescott & Co., Regd. 774, St. Paul St. West, Montreal

A

Tele GLA

THE

V

ma

du not

inv pai

in

car acl val po

COL

las

of

of Th

sea

as lat

the

tio

lal br de

do

SU

WO PI on

le

to

tri



ROTARY RECIPROCATING

## VACUUM PUMPS

ESPECIALLY SUITABLE FOR



HIGHEST POSSIBLE DEGREE OF VACUUM CAPACITIES FROM 2 to 250 Cu. Ft. PER MIN. SIMPLE CONSTRUCTION :: DURABLE :: FAST PUMPING SPEEDS

**Dulsometer Engineering** Mine Elms Ironworks, Reading.



List No. 2777

"REDAC" **PRODUCTS** 



ACID RESISTING **EARTHENWARE** 

ACID RESISTING TILES · BRICKS ACID TOWER PACKINGS RINGS AND BALLS

Successfully used in

GAILLARD TOWERS . ACID OIL SETTLING TANKS GAS WASHERS . CHIMNEY LININGS . ASH SLUICES HYDROCHLORIC PICKLING TANKS, ETC.

PRACTICALLY INDESTRUCTIBLE, CHEAPER & SUPERIOR TO LEAD AND OTHER MATERIALS - Enquiries Welcomed -

B. WHITAKER & SONS, LTD. ST. STEPHENS HOUSE WESTMINSTER

Phone : Whitehall 3616 Works: ACCRINGTON, LANCS.

Grams: Bricavity, Parl, London

# The Chemical Age

A Weekly Journal Devoted to Industrial and Engineering Chemistry BOUVERIE HOUSE, 154 FLEET STREET, LONDON, E.C.4

Telegrams: ALLANGAS FLEET LONDON

Telephone: CENTRAL 3212 (10 lines)

GLASGOW: 116, Hope Street (Central 3970) BIRMINGHAM: Daimler House, Paradise Street, (Midland 0784-5) THE CHEMICAL AGE offices are closed on Saturdays in accordance with the adoption of the five-day week by Benn Brothers, Limited.

VOL. XLVII

October 10, 1942

Annual Subscription, 21s.

## Food Storage and Transport

HE attention lately focussed on the THE attention ratery received the dehydration of foodstuffs brings to mind the great advances that have been made in storage and transport of food during the last 25 or 30 years. It was not until necessity became the mother of invention that detailed attention was paid to this important problem. It was in fact forced upon us by the submarine campaign of 1914-18. The progress achieved since then is a tribute to the value of organised research and to the power of the research weapon in solving difficult problems. It is instructive to consider how this has been brought about.

The difficulties experienced during the last war caused the coal storage interests, who later became the British Association of Refrigeration, to make representations to the Government upon the desirability

of the scientific study of food preservation. The Cold Storage Research Board, formed as a result, led to the later establishment of the Food Investigation Board which inaugurated four laboratories in Cambridge, Kent, Aber-deenshire, and London, and was further supplemented work at the National Physical Laboratory on engineering problems. Great Britain took the lead in this work, and other countries, including Germany and the British Dominions, have since set up similar organisations.

The work entailed is delicate and difficult and embraces many sciences. Changes occur in perishable foodstuffs which must be studied by the biologist and the chemist. The organic chemist must also deal with the fats contained in the foods and with the substances responsible for flavour and aroma. Cold storage in a sense keeps plants, vegetables, and tissues alive in a state of semi-suspended animation; and thus the physiologist and the biochemist must experiment on the factors controlling the growth and respiratory metabolism of the substances stored. The water content of the living cells requires the attention of the physical chemist-who has lately been responsible for much of the recent

On Other Pa	ges		
Notes and Comments			311
The Chemist in the Gas			313
Dropping Mercury Elect			316
Spanish Grapeseed Oil			318
Oxidation of Ammonia			318
Preparation of Styrene			318
Electrochemical Progres	S		319
Chemical Defence in the	U.S.	1.	320
Training in Fuel Econo			320
A Chemist's Bookshelf			321
Letter to the Editor		***	325
Iodine from Flue Dust			325
T' / DI I'		***	323
Mould Inhibitors	444		32:
Personal Notes		***	32-
Photography in Science			32
General News from Weel		eek	
Commercial Intelligence			327
Stocks and Shares			32
Chemical Prices	***	224	328

progress in dehydration. When all these sciences and experts have been invoked to lav down the conditions under which any given product can be successfully stored, the chemical engineer the physicist come into the picture in order to translate scientific conceptions into practice. thermodynamic properties of refrigerants must be considered. The properties of heat-insulating materials must be studied; heat-transfer coefficients and other difficult thermal problems must be determined or solved. Finally, temperature-measuring instruments and instruments for the measurement of humidity and for recording gas composition must be devised and manufactured. The vast changes in food practice that have occurred within the present century have been responsible not only for a great deal of scientific work, but for a very considerable increase in the number of manufactured products and in the labour required for

producing the necessary plant,

The discoveries that have been made as a result of all this work are far-reaching and would require a text-book of some considerable size to describe then adequately. The vast changes in practice that a quarter of a century has brought about are in themselves the best evidence of what has been done. One of the principal discoveries has been that of the useful effect of a moderate percentage of carbon dioxide gas in the storage atmosphere in increasing the storage life of certain varieties of apples; other varieties, however, store better in atmospheres containing only small percentages of oxygen and carbon dioxide. This in itself involves a good deal of intricate chemical engineering work in the production and maintenance of the necessary atmospheres. The refrigerants formerly used consisted entirely of ammonia, carbon dioxide, and sulphur dioxide, these being selected on the basis of heat-engine cycles and by the three Molliere diagrams of temperatureentropy, pressure-enthalpy and entropyenthalpy, all of which are used by designers. A number of new refrigerants have been introduced for specific purposes in recent years, the best known of which is dichloro-difluoro-methane. There are now between 150 and 200 substances recognised as refrigerants.

The discovery that small traces or ethylene hasten the ripening of fruit is another discovery of first-rate potential importance. Sir John Russell in his Messel Memorial lecture remarked that no way had yet been found of controlling or accelerating the processes of nature. Here in a comparatively lowly branch of the animate kingdom is the first step in this direction. The interesting thing about it is that pears, apples, and certain other fruits give off small quantities of ethylene, so that when

ripe fruit is kept in the same chamber as unripe fruit, the rate of ripening is accelerated. Fruit in storage also produces carbon dioxide, and this has an influence on the storage quality. It has been mentioned that some varieties of apples require a low CO<sub>2</sub> content and some a high CO<sub>2</sub> content. Thus the CO<sub>2</sub> content must be controlled at a high value by controlled ventilation with the fresh air; or if a low value is required, the CO<sub>2</sub> produced must be absorbed.

Temperature surveys in ship holds have shown large variations from point to point, and these conditions have now been corrected by distributing cold air over the cargo in ports from a false ceiling instead of blowing the air directly into the chamber from side to side, or of controlling the temperature by cold

pipes in the sides of the hold.

In all these methods the fruit is maintained as a living organism, but recently much attention has been devoted to quick freezing for fruit, fish, and meat, the temperature being then materially lower. Admixture of soft fruits with sugar before freezing delays autolytic changes; another method is to cook the fruit partially before freezing, or to blanch it, and in this way to destroy the enzymes. Special precautions are necessary in the technique of quick freezing to prevent deleterious changes.

In another direction, the need for the conservation of materials in short supply, or required for more immediate war purposes, has made it necessary to look round for substitutes for certain types of food container, and numerous Statutory Orders have turned this necessity into law. For many categories of food, for example, not to mention other commodities, tinplate is now prohibited as a container material. We have, however, not yet reached the stage of substitution reported as existing in occupied Europe, where food containers have had to be marked: "to be consumed at once."

This is but a brief and very incomplete account of some of the chemical engineering and scientific problems of food storage and transport. It is upon the work that has been done in the past upon these subjects that our existence as a nation may now depend. Let this be a reminder that we neglect science only at our peril, whether now or in the years to come.

A issue Brit Serve for cof the over large labor

ing.

worl

weld

and

has

in th

ing:

and

explo

ident

the

SOI

pea

but

to

the

Un

the

art

Mo

ser

bel

tan

cur

ma

abl

reg

Vita

nes

side

ava

age

the

men,

n

f

d

e

a

h

P-

рe

ds

nt

W

ir

of

ld

n-

ly

to

at,

lly

ith

tic

he

to

the

es-

ing

the

up-

var

ook

of

ory

nto

for

odi-

con-

not

re-

ope,

bc

com-

ical

s of

ipon

past

ence

this

ence

the

#### NOTES AND COMMENTS

#### United States' War Potential

HE United States has passed out of the "business as usual" stage to the "all out for war" attitude. Some sort of lag appears inevitable when a peaceable democracy prepares for war, but the Americans have "snapped out of it " rather quicker than we were able to in this country. A special number of the Financial News, devoted to the United States in War and Peace, makes the position quite clear by means of articles, illustrations, and diagrams. Most encouraging, perhaps, is the observation that there is every reason to believe that the U.S. is still some distance from maximum output, despite the current ceilings imposed by certain rawmaterial shortages. Within the measurable future, substantial increases will be registered in capacity output of such vital materials as aluminium, magnesium, and high-grade steel. Considerable reserves of man-power are still available, and while skilled-labour shortages have provided difficult problems, the direction of man-power to the war industries has so far been hesitant, the main emphasis being laid on the reduction of civil employment, rather than on an absolute increase in the labour force. Moreover, the formidable reserves of woman-power are so far almost untouched.

#### Women in Metallurgy

VERY different story as regards A woman-power is told in the current issue of the monthly bulletin of the British Ministry of Labour and National Service. In a new Ordnance Factory, for example, women provide 80 per cent. of the labour force. Elsewhere, women over 40 have proved their efficiency in large steel works, whether in heavy labour, or in such tasks as Brinell reading. One firm has found a woman worker in the shops to be their best welder, both with steel, stainless steel, and aluminium, and (we are glad to say) has told her so. The story of a factory in the S.W. region is especially interesting; here girls are working on alloying and casting magnesium alloy billets for explosives production, performing work identical with that previously done by men, but under stricter supervision. The same firm uses girls on metallurgical laboratory work, one on each of the special duties of analysing, microphotography, spectroanalysis, and research work. These girls were selected from works employees and trained to replace men in their respective laboratories.

#### Post-War Plastics

RGUMENTS for and against pre-A fabrication of buildings have been studding the popular Press a good deal lately, and the usual amount of prejudice and inaccuracy has been revealed in the resultant discussions. It is a good thing, therefore, that the Building Research Station should have published (in the form of a reprint from Chemistry and Industry) the paper read earlier this year by Mr. R. J. Schaffer, a member of the Research Station's staff, on "The Use of Plastics in Building." While doing full justice to the properties and uses of plastics in constructional work, Mr. Schaffer disposes of the idea of the all-plastics house-for the present at any rate. He concludes that an improvement will need to be effected in certain of their physical properties if plastics are to be used in competition with wood and steel as load-bearing parts of buildings; and that full-scale tests will be required and appropriate by-laws framed before proposals of that kind can be put into practice. Although plywood bonded with synthetic resin has demonstrated its utility for external use, it is not justifiable to suppose that the types of moulded plastics so far available will eliminate the need for maintenance decoration of outside work. Further information, in fact, is needed before plastics can be recommended for use externally in permanent domestic buildings.

#### Science and Statecraft

T O the chorus of voices that has lately been raised, demanding that scientists should have a recognised place in the control of national affairs, is now added that of an eminent civil engineer. On his election to the chair of the Yorkshire branch of the Institution of Civil Engineers, at Sheffield last week, Dr. R. H. Evans, who is senior lecturer in civil engineering at the University of Leeds, enunciated this proposition very

E

E

di

tie

M

is

ga

of

sta

in

re

M

m

D

ta

an

m

in

m

be of

ex

th

G

ou

ha

pr

in

re

clearly, as is announced in our news columns on another page. Meanwhile the Government is, in this respect, somewhat grudgingly bowing before the pressure of informed public opinion. Speaking in the House of Commons last week, Mr. Oliver Lyttelton, Minister of Production, answered a number of questions relative to the appointment of three scientific advisers to his staff.

#### **Towards Executive Power**

HE was at pains to point out that he had not created a new Scientific Board, and that the three scientists concerned would be strictly advisers. They would work under the supervision of the Lord Privy Seal, and their recommendations would be brought to the notice of the War Cabinet as might be necessary. He admitted that they might initiate inquiry into any matters within their field, and might even recommend the release for special work of Government scientific personnel. It would appear that a fairly sharp official watch is likely to be kept on the activities of the scientific advisers, and that stress will be laid on their advisory capacity. This may not appear to be a very revolutionary step, but still it is a step in the right direction. Any acknowledgment on the part of the Government that scientists, as such, are fitted to advise in the conduct of the nation's affairs is an important admission. One day, maybe, we shall see a scientific expert invested with executive power-it may sound utopian to-day; when it actually happens, we shall no doubt all take it as a matter of course.

#### More Factories for the Nazis

HE "incorporation into the Reich" of Northern Slovenia, which was announced on October 1 with the usual flourish of trumpets and high-falutin' phrases, is merely another step in the German exploitation of the land and people of Yugoslavia. An examination of the map will show that the new "German " territory includes the industrial areas of Maribor and Rusha, with their important chemical, metallurgical, and other manufacturing plants, which had already been harnessed to the Nazi war machine. No doubt the new measure will draw the reins tighter, while the local labour force will be diluted with German workmen (and, of course, managers) withdrawn from the battered Rhine-

In the words of land and Ruhr. Gauleiter Reiner, the inhabitants of Northern Slovenia now owe allegiance to the Führer and the Reich; they have to do duty in the German army and labour service; they must learn the German language; and (above all) denounce to the German authorities all acts of sabotage and underground activity. The usual penalties are threatened for disobedience. This is just another instance of the penetration of German industry into Slavonic lands, which the Czech and Polish scientific societies (as announced on another page of this issue) have bound themselves to uproot as soon as opportunity offers.

#### Double-Crossing the French

THE French people do well to resist the latest German demands for conscript labour, which are reinforced by Laval's appeals. Double-crossing is the theme of the whole sordid affair; for while prisoners of war are to be released in exchange for the skilled workers sent to Germany, these prisoners on their return are to delve in the bauxite mines of Provence, and so provide more raw material for their fellow countrymen to convert into aluminium for Nazi planes in German factories.

#### New Uses for Glass

LASS is little heard of as a war G material, but a correspondent to the Glasgow Herald reminds us that it is contributing in no small measure to the national effort. Great advances have been made recently by the scientific development of the industry. One of the most interesting features of recent work in Birmingham is the development of pliant, resilient glass used in the construction of ships, electric motors, steam plants, and so on. Scrap glass from broken bottles is used extensively. For electrical and thermal insulation, glass in a fibrous form is proving of great value. Glass plays a part in saving shipping space for other essential commodities. It is used as a substitute for cork and asbestos and has, of course, many uses in the chemical industry. Possibilities for the future are opened up by the development of glass as a textile. In this form it is expected to find employment largely in the electrical industry.

of

of ce

ve nd

he

le-

all

iv-

ed

ner

an

the

(as

ue)

oon

sist

on-

by

the

for

sed

sent

re-

s of

raw

n to

anes

wai

the

con-

the

have

def the

work

nt of

con-

team

from

For

glass

great

aving

com-

e for

ourse,

. Pos-

up by

le, In

ploy-

try.

### The Chemist in the Gas Industry Mr. E. V. Evans's Address to Engineers and Managers

T a recent meeting in Birmingham A of the Midland Association of Gas Engineers and Managers, Mr. E. V. Evans, president of The Institution of Gas Engineers, gave an informal address in which he dealt with the function of the chemist in the gas industry. Mr. Evans said: I wonder whether it is necessary to remind you that the first gas undertaking to realise the necessity of appointing a trained chemist to its staff was Birmingham. Other undertakings followed this example, but the fact remains that Birmingham took the lead. Men such as Harold Colman and E. W. Smith have served as chemists, and you must be very proud indeed to know that Dr. E. W. Smith has risen to so important a position in the Ministry of Fuel and Power.

#### Aims of Coal Processing

I want to speak to you for a few minutes as a chemist. I am not sure if I shall have all chemists in the industry in agreement with me, but that does not matter. If you asked me what should be our aims in developing our methods of processing coal so as to facilitate the

expansion of our industry, I would say:
(1) To be able to deal with a much larger range of coal and not be dependent upon a caking coal of low ash content.

(2) In making gas to produce such a proportion of coke as may be sold advantageously.

(3) To produce a tar that can be readily hydrogenated to liquid fuels required for internal combustion engines.

(4) To carry out the process of coal treatment in a vessel self-heated internally, thus avoiding external heating with its low efficiency and the production of waste products of combustion.

Now the processes being examined on the laboratory scale by chemists of the Gas Research Board aim at carrying out some or all of these postulates. It has been found that if hydrogen under pressure be passed through a bed of coal in which carbonisation has just started, a reaction commences between the hydrogen and the coal substance undergoing decomposition whereby methane is produced. Heat is evolved in this reaction and it may be said that the coal is burning in hydrogen to produce methane. The heat evolved carries on the process of decomposing coal and thus the process is self-supporting.

#### Methane Production

Thus, in the same way that the combustion of carbon in oxygen gives carbon dioxide as the end product, so does the combustion of carbon in hydrogen give methane as the end product and the gas industry can put methane to very good use. The amount of heat evolved per lb. of carbon when hydrogen is converted to methane is about onefifth of that produced when that carbon is burnt in air or oxygen. The methane reaction, therefore, has to be controlled. There are known methods of controlling the reaction and further, if the temperature mounts too high, the reaction slows down and eventually stops. But it is a new technique and the work of taking the laboratory conditions to the next stage of an exploratory small-scale plant will be conducted by chemists well aware of the characteristics of the reaction. Arrangements for the erection of such an exploratory plant have already been

In the laboratory it has been shown that a very wide variety of coals will respond to this treatment. While it is possible to convert the whole of the carbon of the coal to methane it is unlikely that we should wish to do this and, so far as can be seen at present, it appears that if about half the coal can be converted to methane and a primary tar suitable for hydrogenation, the remaining half, which is less easy to treat with hydrogen, may be caused to react with steam so as to produce the hydrogen required in the first stage of the process.

Now the reaction between carbon and steam absorbs heat, and this heat, as you well know, may be supplied externally as in a continuous vertical retort or by interrupting the process to burn a portion of the carbon in air, as in the water

be

th

ar

ra

Co

ch

It

thi

ga

car

in

cat

to

tio

ing

sm

of

ste

be

cal

ane

wo

gas

ma

tan

gas

res

eva

tecl

stan

pro

mo

and

pre

urg

div

thir

in

add

com

gas

do

a n

gas

hav

on a

ing

and

chei

proc

scor

of the

say

larg

1

E

gas generator. It is proposed to add a proportion of *oxygen* to the steam so that the necessary heat is liberated internally where it is required. Such a producer is known to chemical engineers.

#### Cheaper Oxygen

So you see, the preparation of oxygen is part of the scheme, and our chemists at Leeds University, who are ingenious people, possess ideas which should allow of producing oxygen even more cheaply than is the practice to-day, by taking advantage of the high pressure of the gases leaving the methane reaction vessel. By expanding the gas down to reasonable distribution pressures it should be possible to obtain a large degree of refrigeration, probably more than sufficient to supply the oxygen required.

You will see from all this that a great deal has yet to be done before the work has any practical significance in our industry. You may well ask me 'Will the gas made by this process be cheaper than that of the present processes?' I hope so, but really at this stage I don't know, and I might even say, don't care. You see it is a complete revolution from which all sorts of possibilities may arise. There will be many disappointments-they have already been encountered. But you see, chemists are trying to evolve a process of coal treatment which shall be a true chemical process comparable to the synthesis of ammonia by the Haber process, or the hydrogenation of creosote or the hydrogenation of coal by the Bergius process, a process that may be operated by the manipulation of valves and one that takes place in closed reaction vessels self-heated internally.

While this is one line of investigation, the chemists of the Gas Research Board have been collaborating with chemists of the Fuel Research Board upon the synthesis of methane from hydrogen-carbon monoxide mixtures in the presence of a catalyst. Many have attempted to develop this reaction successfully to the large scale—a reaction, the kinetics of which were worked out by Sabatier. The catalyst is a delicate affair which for a variety of reasons can easily lose its activity. I believe that the work which has been done in the last two or three years by these chemists in collaboration

has led us appreciably nearer a solution, though not yet to one. As one of the causes of the loss of activity of the catalyst is the presence of sulphur compounds in the reacting gases, the chemists have made an extensive investigation into the problem of their removal from water gas and from coal gas. It is hoped that the information acquired will lead to a simplified method of removing sulphur compounds from our normal coal gas.

#### Reduction of Sulphur Content

The industry, as an affer-war problem, must take in hand seriously the removal of sulphur compounds from coal gas. The extraction effected by benzol extraction plants is, by many of us, considered to be insufficient. A committee of The Institution of Gas Engineers, under the chairmanship of Dr. Hollings, has recommended that the sulphur content of gas should be reduced to 10 grains per 100 cu. ft. (which is substantially obtainable by special benzol extraction plant), and that as soon as possible the sulphur content of gas should be reduced to 3 grains per 100 cu. ft.

It is now more than 30 years since, as a young chemist, I was instructed to devise a process for the removal of sulphur compounds from gas which should displace the almost unmanageable sulphided-lime process then available. A catalytic process was evolved and was operated for many years. however, the process does little more than adorn text books on the principles of gas manufacture, for the process has been simplified by other workers. That process reduced the sulphur compounds to some 10 grains per 100 cu. ft., and was incapable of doing much better than this as the remaining sulphur compounds consisted mainly of thiophene, which is not decomposed by the nickel catalyst. The advantage of the benzol extraction process is that it does remove thiophene and thus a catalytic process operated in conjunction with benzol extraction will allow of reducing the total sulphur compounds to from 2 to 4 grains.

Not only do I believe it will be found necessary to reduce the sulphur compounds to this low figure, but it is probable that the cost of the process will be recovered by the reduction in the cost of maintaining consumers' appliances.

Believing that the gas industry should

1-

1-

t d

3-

ır

al '

S.

×-

n-

ee

s,

8.

n-

ns

ly

n

he

ed

35

le-

ur

is-

11-

A

a5

IV.

ore

les

as

nat

ids

vas

his

ids

is

st.

ion

ene

in

vill

om-

om-

ob-

be

t of

uld

be in touch with modern developments in the domain of the liquefaction of gases, arrangements have been made to collaborate with the chemists of the Imperial College at South Kensington, and a chemist of the Board is working there. It is considered that the technique of this process should be understood by the gas industry which may require its application as an adjunct to coal processing in closed vessels, or even for the purification of coal gas. It may be interesting to you to know of the following suggestion that has been made and is receiving consideration.

#### Varying Calorific Value

A gasworks, during the months of small gas output, might produce a gas of high calorific value by reducing steaming in the retort. The gas would be reduced to the normal declared calorific value by the removal of methane by liquefaction. Such methane would serve later for enriching water gas when the higher gas load was de-Liquid methane boils at - 161° C. and the insulated storage tanks would have to be connected to the gas stream to avoid loss which might result from the small quantity that evaporates on storage.

Before leaving this cursory glance at technical matters, I want you to understand that the Board cannot make the progress that it wishes to make. A far more serious problem is before the nation and if the services of the few chemists at present engaged were required for more urgent work, their energies would be diverted immediately to that work.

I see that I am "billed" to say something about the function of the chemist in our industry. This will make my address quite disjointed, but I do welcome the opportunity of speaking with gas engineers about the chemist. Please do not imagine that because you employ a man practised in the carrying out of gasworks tests and in that only, that you have a chemist. There must be testers on a works as there are tracers in a drawing office, and they both carry out worthy and necessary tasks. The training of a chemist, however, is a long and arduous process, and the finished product, if given scope, can do work as important as that of the engineer. I would go further and say the future of the industry depends largely upon the chemist and the

physicist. But he must be closely associated with the administrator of the gas undertaking, and that administrator must possess such a comprehensive outlook that he and the chemist may talk together with understanding. I am well aware that not every undertaking can afford to employ a chemist, and this is another step in the case for regionalisa-

#### **Engineer** and Chemist

Now let me say a word to the chemist in our industry. Please don't think that because you know something about interfacial tension or because your organic chemical soul shudders when you examine a piece of retort carbon that you are an archangel, a thing apart, a museum piece. The gas industry is a great achievement worthy of the respect of every chemist and the majority of engineers are masters of their job and possess wide experience and responsi-You must first become intibilities. mately acquainted with the processes of gas manufacture practised by your own undertaking and elsewhere, and then you must learn to present your ideas in a manner that engineers and managers can understand. This is not so simple as it may seem to be. The gas engineer is not going to waste his time listening to you explain that something or other is due to a surface phenomenon, particularly when you are only using the term to cover up your own lack of understanding. If a certain happening is really due to surface phenomena then be prepared to demonstrate it by diagram on paper, or better still, by experiment.

The development of industrial processes is a matter of collaboration between the engineer and chemist, and the understanding between them must be such that they can work together intimately. The training of the modern gas engineer, to-day, is all in the direction which will allow him to talk with under-

standing with the chemist.

In the discussion which followed the address by Mr. E. V. Evans, Mr. G. M. Gill (Severn Valley) agreed with the importance of the chemist to an industry operating what was essentially a chemical process, and supported the arguments for the removal of sulphur from gas. Mr. George C. Pearson (Birmingham) spoke of the help that successive chemists had been to the Birmingham Gas

tul

the

use

po

ap

ma

to

Department, while coal tests and chemical control had been of tremendous value in getting the best out of the existing types of carbonisation plant. Mr. T. F. E. Rhead (Birmingham) said he had been impressed with the considerable number of works which were unable to have the advice of a chemist on their day-to-day problems and suggested that a gas chemists' pool should be formed in each region. The chairman interposed expressing his appreciation of Mr. Rhead's suggestion and proposed that they should write to the Advisory Panel.

In his reply to the discussion, the president of the Institution said that the question of undertakings that could not afford to retain their own chemists was one which must receive attention. responded to a request from Mr. S. Brockbank (Walsall) that an explanation might be given of the difference between the Bergius process of coal hydrogenation and that which he himself had mentioned. The Bergius process operated at higher pressures than the one that he had described, and at lower temperatures, the object being to avoid carbonisation and to add hydrogen to the coal substance, thereby converting it to a required fuel. In the gas-making pro-cess described, carbonisation was carried out and the temperatures rose to 800° C, or more, and the hydrogen acted upon the coal while the coal was actually undergoing decomposition.

## Dropping Mercury Electrodes Two Efficient Types Detailed

POLAROGRAPHIC analyses, and allied operations such as amperometric titrations, are dependent in large part on the

efficiency of the dropping mer-Two characcurv electrode. teristics of first importance in the constitution of such electrodes are that the capillary should be easily cleaned, and that the mercury used should be clean when put into the electrode, and should remain These two desiderata point towards, first, a removable capillary, and, secondly, the minimum of rubber connections in the construction of the electrode; for it has been found that a reaction takes place between mercury and rubber which produces contamination of the former. Two electrodes have been described recently which are simple in operation, which go far towards fulfilling the requirements for an efficient piece of apparatus which is not too complicated for ordinary construction and

The simpler of the two electrodes (McReynolds, Ind. Eng. Chem., Anal. Ed., 1942,

14, 586) is constructed mainly from a 250 ml. distilling flask (Fig. 1). A long tube sealed into the neck of the flask allows any desired

head of mercury, from 24 to 70 cm., to be built up. The adjustment of the head is by means of a rubber bulb fitted with a

valve; pressure is applied by the bulb, forcing mercury from the reservoir into the vertical tube to a point higher than that required. Releasing air slowly through the valve then permits of exact adjustment of the pressure on the capillary to a reproducible value. The capillary itself is detachable, being joined to the main apparatus by as short a length of rubber tubing as possible. Before use it is washed with concentrated nitric acid, dichromate cleaning mixture and distilled water, and finally dried.

A more complex electrode is described by Kahan (Ind. Eng. Chem., Anal. Ed., 1942, 14, 549). This has, however, the advantage that it is completely constructed of glass, thus eliminating the possibility of contaminating the mercury. The use of rubber has been avoided by substituting a system of ground

glass joints. There are two of these joints (Fig. 2). The first, D, allows the capillary to be detached for cleaning. The second joint, E, permits a

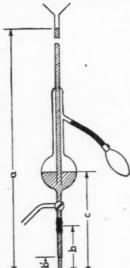


Fig. 1.

seco mere of i been Ana more cons inste of th abou arm. metr shor trode meas draw of th meas const

is ha

tubir

const

in m

will I

Fi

mine

n

n

i-

d

e

1-

n-

al

a

0-

ed to

d

13

be

is a by

ury

the

int

red.

ugh

of

res-

re-

pil-

ble,

ap-

ngth

ible.

with

di-

ture

and

rode

(Ind.

1942,

ever,

com-

glass,

possi-

ubber

ubsti-

round

two

t, D,

nits a

the

Fig. 2.

tube to be attached for the protection of the capillary when the apparatus is not in use. The same joint also enables the apparatus to be connected neatly to the polarographic cell for operation. The polarographic cell for operation. apparatus is filled, and a suitable pressure maintained, by a syphon arrangement. Suction and pressure at A allow for filling to to a fixed mark, while the tube B acts as a mercury reservoir.

The author describes an ingenious method for blowing a bulb on the end of the very fine hore capillary to enable it to be sealed on to wider tubing. This may well prove useful in other fields. length of capillary tubing is almost filled with mercury. and one end is sealed in the flame, while stopping the other end with a finger. The other end is then also sealed: and when it is subsequently heated strongly, the pressure developed by the mercury inside is sufficient to blow the end out into a bulb in a way that would be impossible by ordinary blowing, on account of the thick walls of the tubing.

Since there is a possibility that the dropping rate of a capillary may vary after pro-longed use, giving rise to erratic results, this value should be checked for any electrode from time to time. The constant is usually deter-

mined in terms of mgm, of mercury per second, by weighing directly the amount of mercury delivered over a measured period of time. A simpler method has recently been described (Lingane, Ind. Eng. Chem., Anal. Ed., 1942, 14, 655) which enables a more rapid check to be made (Fig. 3). This consists in checking the volume per second instead of the weight per second. A U-tube of thick-walled capillary (internal diameter about 0.4-0.6 mm.) has a long and a short arm. The long arm is attached to a millimetre scale, while a cup is sealed on to the short arm. Drops of mercury from the electrode are collected by the cup over a measured period of time, and are then drawn by gentle suction into the long arm of the apparatus. The length of the column, measured in this arm, is a measure of the constancy of delivery of the electrode. It is hardly necessary to stress that capillary tubing of uniform bore should be used for construction of the apparatus. If the temperature is controlled within  $\pm$  3°, the error in measurement through temperature effect will be less than ± 1%.

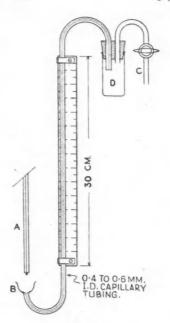


Fig. 3.

#### FUEL ALCOHOL IN BRAZIL

In view of the importance of anhydrous alcohol for fuel purposes, the Sugar and Alcohol Institute of Brazil has drawn up a general plan for alcohol production, the salient points of which are as follows: a selling price of 2 milreis per litre is fixed for producer's sale of hydrous alcohol to industry and commerce, of which 500 reis must be paid into a special fund to be created by the Institute; producers must declare their sales weekly, and quotas are to be established for sales to industry and commerce; sugar factories possessing anhydrous alcohol distilleries are forbidden to produce potable alcohol except by special authorisation of the Institute; alcohol produced for fuel purposes is to be consumed within the respective producing States and any excess is to be exported to other States; the manufacture of aguardente (rum) from alcohol is prohibited. In the latter connection it is remarked that the total output of aguardente in Brazil in 1939 reached 164 million litres, thus considerably exceeding the production in that year of 97 million litres of alcohol.

n

W

10

11

0

tl

d

T

re

0

de

in

es

re

aı

al

al

ar

bi

in

pi

be

di

pe

ut

po

fo

pa

61

ch

pr

th

of

all

pla

ac

ca

th

res res ha

of

cei

ve:

#### Spanish Grapeseed Oil

An Analytical Study

S OME years before the war the replacement of imported linseed by the plentiful home-produced grapeseed was under serious consideration in Italy as a source of oil for the paint, soap, and allied industries. It has not been disclosed, apparently, whether extraction is now practised in Italy on any extensive scale, but it is significant that Spain is now evincing a keen interest in the possibilities of this oil.

A detailed analytical study of grapeseed oils extracted in various parts of the country is published by Ruiz and Munoz in the April, 1942, issue of Ion (Madrid). Rather wide variations in some constants from one variety of grape to another were recorded, but the following figures are fairly typical: sp. gr. (20° C.) 0.9318, iodine value 122.2, saponification value 196.46, acid value 196.16. These relate to the dark-green oil isolated from the seed in a yield of 8 per cent. by extraction with ethyl ether, petrol-cum ether, or carbon bisulphide. The free fatty acids, prepared from the same oil by saponification with alcoholic soda and treatment with sulphuric acid, had sp. gr. 0.9194, iodine value 97.67, and m.p. 24° C. Interest also attaches to the unsaponifiable

Interest also attaches to the unsaponifiable content of the oil (3.4 per cent. in the above instance), the presence of ergosterol and vitamins A. E., and K being established in spectrographic and chromatographic studies. Finally, reference is made to the possibility of using the seed residues as fertilisers and, in the last resort, as fuel

### Oxidation of Ammonia

Air-Oxygen Mixtures Used

WHEN cheap supplies of oxygen are available, it is worth while to enrich air used to oxidise ammonia by oxygen, This suggestion is investigated by V. Atroshchenko and E. Sedasheva in J. Appl. Chem. Russ., 1941, 14, 500. In air-ammonia mixtures the percentage of ammonia oxidised rises when the concentration of ammonia decreases; only when the NH, concentration drops below 11.5 per cent., i.e., when the ratio O2: NH2 exceeds 1.7, does the degree of oxidation become high (over 95 per cent.) and almost independent of the concentration of ammonia. When airoxygen mixtures are employed, the ratio O.: NH, at which the degree of oxidation is high and constant is again about 1.7, and the concentration of NH, can be higher. Too high concentrations of NH, cannot be used, however, because of the explosive danger associated with heating oxygenammonia mixtures. The advantage of using larger concentrations of amnionia depends on the observation that the amount of ammonia oxidised is nearly proportional to the concentration of ammonia between 11.5 per cent. and 17 per cent. of NH., if the conditions are so chosen that the degree of oxidation remains constant. amount of 13.5 per cent, ammonia oxidised by 1 sq. meter of a platinum-rhodium wire (Pt 93, Rh 7) is, at 900° C., 800 kg. per 24 hours if the oxidation is complete to 97 per cent.; if the degree of oxidation is 96 per cent. or 95 per cent., the productivity is 1050 or 1350 kg. per 24 hours, respec-tively. Above 900° C. the degree of oxidation is lower, if the time of contact remains\* The recommended conditions constant. are, therefore: temperature 850-900° C., concentration of NH, 14 per cent., of O2 28 per cent.; the speed of gas is such that 95-96 per cent. of NH, is oxidised and 1050 kg, of NH, is converted in 24 hours per 1 sq. meter of the catalyst. No preheating of the air-oxygen-ammonia mixture is advised.

#### Preparation of Styrene

Me-Ph Carbinol as Starting Material

ETHYLPHENYL carbinol is a con-Menient material for the preparation of relatively pure styrene for manufacturing polystyrenes. A. Vansheidt and V. Zeltser (J. Appl. Chem. Russ., 1941, 14, 521) have investigated the dehydration of this alcohol in the gas phase. Clay activated by boiling with 5% hydrochloric acid turned out to be a mediocre catalyst, and most of the experiments were carried out with aluminium oxide precipitated from a sodium aluminate solution and dried at 350-400° C. methylphenyl carbinol was evaporated in one half of a glass U-tube and then passed over the catalyst contained in the other half. The yield of styrene increased when the temperature of the catalyst rose from 300° C. to 380° C. but was constant between 380° C. and 400° C.. At 400° C, the yield of styrene slightly increased when the amount of the carbinol passing through one litre of catalyst per hour increased from 400 to 550 g., remained constant at 87-89% when the rate of flow increased from 550 g per hour to 750 g. per hour, and diminished again when the rate of flow increased further. This reduction of the relative yield was, however, only slight, and the amount of styrene obtained per hour per litre of catalyst increased with the rate of flow; it was, e.g., 380 g. when the rate of flow was 550 g., 520 g. when the rate of flow was 760 g., and 2150 g. when the rate of flow was 3820 g. The catalyst was tested in 12-hour runs; its activity rose during the first hour and did not vary later on; the authors consider, therefore, the stability of the catalyst to be satisfactory.

al

en if

ee he

ed

re

er 97

96

ity

èc-

la-

ns.

ns

O<sub>2</sub>

950

per

ing

is

1

on-

of

ing

ser

ave

hol

ing

be

eri-

ium

nate

The

ver

alf.

the

000°

reen

ield

the

one

rom

89%

0 g.

shed

fur-

rield

ount

e of

v; it

was

flow d in

the

the

ty of

## Electrochemical Progress

Dr. Wernick's Review of Modern Electroplating

In this recent address to the Midlands Centre of the Electrodepositors' Technical Society, Dr. S. Wernick, the chairman, chose as his subject "The Trend of Electrodetics". plating Development." Introducing his material with a glance at the ubiquity of electroplating in modern life, he referred to the change of its orientation from peace to war objectives, and gave an outline of the position of the industry in 1939. He reminded his audience of the progress made in the bright nickel plating process, the benefits of which were then gradually spreading throughout the industry, notably in the production of the alloy deposit nickel-cobalt. The deposition of alloys in general had been receiving considerable attention and much useful work had already been published not only on binary, but even on ternary alloy deposits.

#### Protective Plating

Rhodium plating was also being increasingly used as a finish on articles of an expensive and luxury type. Other processes receiving increasing attention included the anodic oxidation of aluminium and its alloys, and electrolytic polishing. A very considerable amount of protective metal plating was also being carried out, this including cadmium and zinc plating, while the production of bright zine plating was also rousing much interest. Not less important, perhaps, were the developments in the production of improved types of plant,

Although little bright nickel plating was being carried out to-day, under war conditions, the technique which resulted in the perfection of bright nickel as a process was utilised to a considerable extent in the deposition of thick deposits of nickel largely for building up worn or wrongly machined parts. With regard to anodising, the experience gained in the operation of both the chromic acid and sulphuric acid processes in pre-war days, has proved of great benefit, and there have been big increases in the output of cadmium and zinc plated components for all types of armament material.

Another finish which has been increasingly specified by Government departments is tin Here again, considerable benefit accrued as the result of researches which were carried out simultaneously in America and this country on the efficiency of tin plating solutions immediately before the war. result, the old inefficient tin plating bath was replaced by the stannate electrolyte, which has taken a great deal of the uncertainty out of commercial tin plating. It is true that certain precautions have to be taken to prevent stannite from forming in this bath, but once understood they are quite readily applied in workshop practice and are well worth the effort entailed.

#### **Immersion Finishes**

Among the metal finishes that have received a noticeable impetus are those produced by immersion as distinct from electrolytic finishes. These are having a very considerable vogue at present and include the Parkerising, Bonderising, and Cosletting processes for ferrous material; and Granodising and Chromating for zinc base material. A considerable demand has also arisen for black immersion finishes on steel.

After a brief review of general post-war possibilities, Dr. Wernick continued: "I believe that already the electroplating industry is specification-conscious and that the benefits of adhering to a specification have now become manifest in many quarters where previously there was considerable doubt, and already a considerable amount of work has been done in the way of standardisation of materials used by the electroplater, much of which originated through this Society, and was also carried out by its own Standards Committee, along with the British Standards

" The use of chrome deposits for wear resistance, apart from decorative plating and building-up applications, is likely to see a considerable impetus in the post-war period, while the application of heavy nickel and abrasion-resistant chrome deposits on a really big scale will mean something in the nature of a revolution in electrodeposition technique and plant requirements.'

#### Competition with Plastics

In conclusion, Dr. Wernick referred to the incidence of competition from other indus-A recent source of anxiety to the electroplating industry, he pointed out, has been the advent and very vigorous growth of the plastics industry. Undoubtedly, bakelite has proved to be an important material in the mass production of common articles, and to some degree has superseded similar articles constructed in metal which have commonly received an electroplated finish. However, he could not envisage a world in which the æsthetic appearance of silver plating or the appearance of chromium plating would be entirely replaced by the pastel shades of semi-bright synthetic materials. Indeed, a recent development indicated clearly the resourcefulof the electrodeposition industry, namely, the production of electrodeposits on bakelite itself as a basis material, a tribute in itself to metal as a final surface finish.

ch

kı

hy

th

Oi

ap

ex

81

fo

VC

th

pu

eu

ta

W

m

W

tr

ne

SV

tr

111

to

ch

al

va

lit

gr

ta

in

Pi

tie

re

at

a

ac

be

su

pr

tic

re

er

ha

Sic

m

is

ti

### Chemical Defence in the U.S.A.

#### Provisions for Anti-Gas Training

NCREASING interest in the United States of America on the subject of gas warfare, or, more precisely, of anti-gas precautions, is reflected in the current scientific press. The Office of Civilian Defence has constructed a chart, reproduced in J. Chem. Educ., 1942, 19, 5, p. xiii, which classifies the known chemical warfare agents into vesicants, lung irritants, lachrymators, sternutants, smokes, and incendiaries. The characteristics of these (the physical nature, odour and physiological effect) are illustrated diagrammatically, together with details of the treatment of casualties and the protective measures necessary. In addition, columns giving notes on the persistence and the decontamination procedures are included.

#### Works Chemists Co-operate

Certain local classes have been started in order to instruct civilians in the methods of dealing with both incendiary and chemical attack. One of these, in Minneapolis (Chem. and Eng. News, 1942, 20, 771) has as many as 150 instructors who demonstrate to classes of air-raid wardens, auxiliary firemen, policemen, industrial groups, and so forth. The most ambitious scheme of this nature is that organised by the Western Connecticut section of the American Chemical Society. Chemists of that section (which includes the American Cyanamid Co. and the Air Reduction Co.) have co-operated with the auxiliary police in Stamford to organise and equip a gas identification service. A recent article (Bradley, Chem. and Eng. News, 1942, 20, 803) describes the degree of development of the organisation up to now. A portable set contained in a canvas bag has been devised which includes all the reagents likely to be necessary for the detection of war gases, together with a complete range of test papers and the The article cited necessary apparatus. gives full notes on the preparation of the reagents and test papers. Perhaps the most interesting piece of apparatus described is an aspirator, built up from a 5gallon drum and various odds and ends, which serves for air-flow analysis either of solid samples or of the atmosphere. Since it works by water aspiration, it does not need continuous attention, and will operate for from 15 to 60 minutes, according to the rate of water flow. This means that it may be lowered into cellars or introduced into other places where the concentration of gas might be dangerous, and left to operate without endangering any of the anti-gas personnel. An added refinement is that the drum is painted with a special khaki paint

(the recipe for which is given); owing to the inclusion of less than 1 per cent. of spirit-soluble nigrosine, this paint acts as a gas-detecting paint for mustard gas. The nigrosine is extremely soluble in mustard gas, the presence of which is indicated by a change in colour from khaki to black.

Since the civilian population in the U.S.A. has not yet been provided with gas masks, and it is stated that the supply is likely to be short for some months yet, a recent article describes the preparation of a reasonably serviceable civilian respirator and goggles, using easily available materials (Tanner, J. Chem. Educ., 1942, 19, 322). Activated charcoal is used as adsorbent in both of these, while the former also contains a glycerine-starch paste. For the goggles the charcoal is spread on adhesive tape, and fitted into the lens cavities, while the respirator holds the absorbent in a perforated metal container made from a condensed-milk tin. A method is described for the preparation of activated charcoal, as well as a test which determines approximately the efficiency of the material when prepared. It is judged that the two-piece mask will afford adequate civilian protection over a period of at least an hour, that is, long enough to enable the wearer to escape from a gas-contaminated area. It is of interest that practically no rubber is used in the manufacture of this mask.

#### TRAINING IN FUEL ECONOMY

Following the recent speech by the Minister of Fuel and Power at Nottingham, in which he drew attention to the scope and the urgent necessity for fuel economy in industry, an important meeting was held in London between the Fuel Efficiency Committee of the Ministry and representatives of more than 30 Trade Associations, These Associations cover industries which consume in the aggregate more than 25 million tons of coal a year. Among matters discussed were: the duties and status of fuel efficiency officers; measurement of fuel consumption per unit of product in order to provide a "yard stick" for the assessment of fuel efficiency in each industry; and bonus schemes to encourage fuel saving.

It was reported that the scheme for training fuel efficiency officers and boiler firemen was in full swing. Lecture courses will again be held this winter and will start within a few weeks at more than 60 centres. The recommendation was made that, in every firm someone possessing a knowledge of fuel should be appointed to act as a fuel officer or "fuel chaser."

a

e

8

S

a

f

r

۸.

1-

r

r

3.

8,

n

a

1.

n

e.

C.

at

to

is

Y

is-

in

in

in

m-

es

SP

n-

on

is-

iel

n-

to

ent

nd

in-

re-

ses

es,

in

lge

uel

#### A CHEMIST'S BOOKSHELF

Hydrogen Ions: Their Determination and Importance in Pure and Industrial Chemistry, By H. T. S. Britton, 3rd Ed. London: Chapman and Hall, 2 vols., pp. 420 and 443. Each vol. 36s.

2 vols., pp. 420 and 443. Each vol. 36s. It is, of course, hardly necessary to recommend Professor Britton's work to the chemical reader, since his name is well known in connection with the study of hydrogen ions, and the previous editions of this present monograph have been standard on the subject. It is ten years since the appearance of the second edition, and the extra material (in addition to comprehensive revision) which Professor Britton has found it necessary or advisable to include has called for an expansion into two volumes. This is thoroughly justified by the result. It is very gratifying that the publishers also, in view of the known difficulties of their trade to-day, have undertaken such an extension.

The first volume is concerned primarily with the general theory and methods of pH measurement, while the second volume deals with the application of pH work to chemistry, both pure and applied. Some of the new chapters discuss oxidation-reduction systems, the place of hydrogen-ion concentration in analytical chemistry, and the more modern applications of general theory to the theory of the hydrogen ion. Sixteen chapters in the second volume are specifically devoted to the part played by pH in various industrial processes. The very full literature references throughout the monograph round it off, and ensure its prime importance to all those chemists who must take account of hydrogen-ion concentration in their work.

Perfumes, Cosmetics and Soaps. By W. A. Poucher, Ph.C. 6th Ed. London: Chapman and Hall. Vol. 1, Pp. 459, 30s. Vol. 2, Pp. 430, 30s. Vol. 3, Pp. 234, 25s,

The 203, 208.

The appearance of a further revised edition of this justly celebrated work must be regarded as a signal achievement, especially at the present time. The author, without a doubt the foremost British perfumer still actively engaged in the industry, has never been content to rest on his laurels. Each successive edition of his work exhibits improvements and additions, nor, in this edition, does he disappoint us by failing to take recent developments into due account.

Of course, there are minor omissions. Some of these may have been made deliberately, as a matter of policy; others may have been regarded as unworthy of inclusion in the space available. Perhaps the most notable of the author's characteristics is his typically English reticence; there are times when Poucher says more, in a sen-

tence or two, than most other writers could say in as many pages. The author's formulæ, while not always perfect as they stand, are nevertheless first-rate "shorthand" for information that would otherwise occupy unnecessary space. Such formulæ should be carefully examined for the kind and type of materials suggested, as well as for the ratio of oil to water, or of any other particular constituent to the rest.

The first volume remains primarily a dictionary of raw materials. Since the last edition, much research has been devoted to cosmetic chemicals, of which the author has dealt with over twenty. Six new aromatic synthetics are listed, as well as eight new essential oils. This interesting and thoroughly informative volume is of exceptional use to the perfumery chemist who, at the present time, is always on the look-out for information that will enable him to utilise his available supplies to the best advantage and evolve substitutes for those materials that have now ceased to be available.

Volume 2° is correctly regarded as the author's masterpiece. The core of the book consists of an authoritative series of "Monographs on Flower Perfumes." Since the publication of the previous edition, considerable information has come to light concerning the constitution of some of the natural flower oils. The more important results of Continental research have been embodied in the respective monographs, and many of the formulae cited have been adjusted accordingly.

Volume 3, in the chapter dealing with hair creams, includes notes on the formulation of modern triethanolamine stearate "brilliantine" creams and the scarcely less interesting sodium alginate preparations. No formula is given, however, for hair creams based on partially sulphated fatty alcohols. A very sound description of hair lacquers appears in this new volume—also a good formula for complexion milk. Careful consideration given to the many new substances that have nowadays found their way into cosmetic manufacture has necessitated the inclusion in this volume of much new matter.

Both Mr. Poucher and his publishers deserve congratulation on a really exceptional performance.

WAR GASES AND FOODSTUFFS. By W. R. Wooldridge, Ph.D., M.Sc., M.R.C.V.S. London; Leonard Hill. Pp. 50. 2s. 6d.

This timely booklet deals in a most effective manner with the dangers (as far as they can be visualised) to which food supplies will be exposed in a gas attack and the approved methods of counteracting them. The chief danger is likely to arise from a combined high-explosive and gas attack which could not be met by purely protective mea-

of

V6

in

is

st

is

at

th

tic

th

th

11

01

tai

lov

aft

it

wa

hai

the

ZO

me

pla

wa

of

gav

me

sol

bes

ton

of

The

wei

die

SWE

sho

alce

C

tair

met

at (

ben

ises

of c

of s

tain

ture

solu

ratio

pure

sures. In such an eventuality the Gas Contamination Officer would be required to move into action with the necessary techniques of decontamination and salvage, while the Gas Identification Officer's knowledge of the properties of the various war gases would be equally vital. The author drives home the importance of co-operation tween the G.C.O. and the G.I.O. and his observations will be widely approved by all practical men in this field. The multiplicity of war gases (which term embraces many toxic liquids) calls for a large number of relatively simple methods of detection and estimation. The analytical scheme put forward in the final chapter meets the needs of the situation admirably and has the additional merit of incorporating several recently published methods, hitherto scattered throughout the periodical literature.

#### LETTER TO THE EDITOR

#### Standardisation of Terms

SIR,—In a recent number of THE CHEMICAL AGE (September 12, p. 254) there is a short note entitled "Photomicroscopy for Petroleum." In this article photomicroscopy is defined as the making of pictures with a combination camera and microscope. Might I make a plea for the rationalisation and standardisation of the terms to be applied to combined use of the camera and the microscope? These terms have already been defined (Chamot and Mason, Handbook of Chemical Microscopy, Vol. 1, 2nd ed., 1938, p. 233) but confusing references are still to be found in the literature.

When an object under the microscope is photographed in order to produce an enlarged image, the resulting picture is a photomicrograph. When a very small photograph of an object is taken, so that it must be enlarged before visual examination (as in microfilm records), we have a microphotograph. The two terms are often inexcusably confused in publications dealing with these topics.

The use of photomicroscopy seems to me completely indefensible. We take a photograph (literally, the writing of light) and not a photoscope. There is no indication in the word photomicroscopy that a permanent record has been made. If one endeavours to assess the meaning of the word by derivation, one arrives at "the seeing of the very small by light"—which is merely what all microscopy is. If a permanent record is made by "the writing of light,"—by photography—then the recognised scientific usage (cf. spectroscopy: spectrography) demands that the termination of the word should be -graphy.—Yours faithfully.

" MICRO."

Iodine from Flue Dust
German Experiments

HE blast-furnace flue dust accumulated THE blast-turnace due to the blast-turnace full due to the blast-t Bierwes smelting plant of Mannesmann tube works. About 171 tons of flue dust are produced every 24 hours, and these contain about 111 lb. of iodine, i.e., 0.025-0.035 per cent., in addition to substantially larger amounts of sodium, potassium, fluorine, and organic compounds. Experiments have resulted in the development of a process for the recovery of most of the iodine content. The dust is first boiled with water, a procedure which results in a concentration to one-thirteenth of the gross weight, while the loss of iodine does not exceed 10 per cent. The resultant material thus obtained contains largely potassium and sodium chloride, potassium and sodium carbonate, and organic compounds. The last are destroyed by calcination at 700° C.; the heated salts are then dissolved, and the iron oxide which forms as a residue is separated. Next the material is precipitated with calcium chloride in order to reduce the fluorine content, and then the clear solution is slightly acidified and distilled so that the iodine is recovered in a comparatively pure state.

The economic side of the process, which has not yet left the experimental stage, depends largely on the possibility of utilising other minerals contained in the flue dust. Fertiliser experiments with the crude potash salts obtained after the concentration proved unsuccessful, for while plant tops seemed to benefit from the material, roots were adversely affected, probably because of the fluorine content. During the process as further developed, however, 70 per cent. of the total potash content of the flue dust is recovered in the form of potassium chloride with 98.5 per cent. K<sub>2</sub>O. No information is available about early plans for a utilisation of the process.

#### NEGLECT OF WAR INSURANCE

The Board of Trade has reason to believe that a number of traders and firms who are required to insure their stocks or equipment under Part II of the War Risks Insurance Act, 1939, or Part II of the War Damage Act, 1941, as the case may be, are failing to comply with their statutory obligations by either not insuring at all or insuring for a sum considerably short of the full value for which the law requires them to insure. A number of prosecutions have recently been instituted by the Board against persons who have failed to comply with their obligations and traders are warned that the Board will not hesitate to enforce the provisions in question wherever necessary.

Sentember 30, 1942,

ed a-

eh

be

re

in

er

er

nd

re-

or

nt.

ro-

to

he

nt.

on-

de.

nd

red

ilts

ich

the

nt.

idi-

re-

de-

ing

ust.

ash

ved

ned

ad-

the

as

st is

ride

n is

tion

CE

lieve

are

nent

ance

nage

ig to

s by

e for

been who

tions

will

s in

### Ketone Plastics

#### A Study of Methyl Isopropenyl Ketone

THE preparation of methyl isopropenyl ketone (CH<sub>3</sub>,CO.CMe: CH<sub>2</sub>) and its polymerisation either alone or mixed with other unsaturated substances has been investigated by B. Rutovsk (J. Appl. Chem. Russ., 1941, 14, 528, 535, 532). The first stage in preparation of methyl isopropenyl ketone is condensation of methyl ethyl ketone with formaldehyde. Formaldehyde is used as a strong formalin solution, and the mixture is made alkaline; if the pH of the medium at the onset of condensation is 8.4 and, after the neutralisation preceding the distillation, 5.8, the yield reaches 87% of the theoretical. The second stage consists in the dehydration of isovaleric acid (CH<sub>3</sub>, CHMe.CH<sub>2</sub>, COOH) by heating with 1% of dehydrated oxalic acid.

The polymerisation of undiluted methyl isopropenyl ketone was carried out at 50°-110° C. in presence of benzoyl peroxide. Only at 50° C, is a colourless polymer obtained; at higher temperatures it was yellow. The yield of polymer at 50° is 72-80% after 100 hours and 78-85% after 160 hours; it was the higher the more benzoyl peroxide was employed (0.25% 1.5%). On the other hand, the viscosity of polymer solutions was the higher the smaller the amount of benzoyl peroxide used in the course of polymerisation. When polymerisation took place in solution, the temperature of 50° C. was again the highest at which a colourless product was obtained. After 100-160 hours of reaction 70: 30 methanol-water mixtures gave the highest yield (up to 55%) of polymer, which also had the highest viscosity in solution; water-free methanol was the next best solvent, followed by benzene and acetone. In these experiments equal amounts of the ketone and the solvent were used. The polymers softened at 65°-83° C. They were soluble in acetone without, and in dichloroethane with discoloration; they swelled in hot benzene and hot toluene, but showed neither swelling nor dissolution in alcohol, ether, or chloroform.

#### Styrene-Ketone Mixtures

Copolymers with styrene have been obtained by keeping mixtures of styrene with methyl isopropenyl ketone without solvent at 65° for 35 hours in presence of 0.5% of benzoyl peroxide. Since styrene polymerises more easily than the ketone the yield of copolymer increased with the percentage of styrene and the copolymer usually contained more styrene than the original mixture. The viscosity of the copolymers in solutions was, for almost all styrene iketone ratios, higher than that of either of the pure polymers. The impact strength was

determined for two copolymers containing 10% and 25% of ketone, respectively; it was over 10 kg. cm. per sq. cm. as against 5-9 kg. cm. per sq. cm. found for polystyrenes. Styrene and ketone are in a chemical combination in the copolymers since they cannot be separated by solvents. Copolymers containing 15% of styrene or more are soluble in benzene. Attempts were made to prepare copolymers by heating styrene and methyl isopropenyl ketone with 4 volumes of toluene at 65° C., but the yield was small and the resulting polymer containing only 10% of styrene gave a polymer consisting of 83% of it. Even less ketone was found in polymers obtained in aqueous emulsions stabilised by saponified coconut oil

Copolymers of methyl isopropenyl ketone and methyl methacrylate have been pre-pared without solvent and in 70% aqueous methanol. In absence of solvent, after heating for 8 hours at 65° C., only copolymers containing over 75% of methacrylate could be obtained. In solution, heated at 65° C, for 16 hours, also the 50-50 copolymer could be synthesised. The copolymer containing 25% of ketone had the highest softening point (145° C.) and often a higher viscosity in solution than polymethyl methacrylate. It was soluble in cold benzene and in hot toluene. Its Brinell hardness was almost equal to that of polymeric methacrylate (14.4 kg./sq. mm. as against 15.9 kg./sq. mm.), but the copolymer with 12.5% of ketone was harder than both: 19.0 kg./-Films of these copolymers showed good adhesion to glass and took up about as little water as pure polymeric methacrylate.

#### MOULD INHIBITORS

Propionate salts are widely used in the dairy industry to inhibit growth of mould on butter and cheese. For "dry wrapping" of products, parchment impregnated with propionate salts sufficient for adequate mould retardation in butter is made by paper manufacturers. For "wet wrapping" of butter, the parchment must be treated just before wrapping by soaking in a solution containing about 20 oz. of propionate salt per gallon of water. Low concentrations of propionate salts added to various types of cheese are very effective as mould inhibitors. In certain types of cheese it has been found that it is necessary to immerse cut cheese in a solution of the inhibitor for only fifteen seconds to increase the mould-free period by 300-400 per

fo

in

CO

m

be

pl

C

of

pa

or

re sa

sh

E

af

th

pl

po

in

th

th

m

in

m

pe he

21

G

M

in

he

0

re

OI

5

u

in

to

#### Personal Notes

MR. F. K. Kielberg, chairman and managing director of the United Molasses Company, has been elected a director of Tankers, Ltd., and appointed chairman and managing director of that company, in succession to Mr. J. F. Cunningham, who has resigned.

At the invitation of the Managers of the Royal Institution, SIR HENRY DALE, President of the Royal Society, has accepted the Directorship of the Laboratories of the Institution, with the Fullerian Professorship, in succession to the late Sir William Bragg. Sir Henry has expressed the wish that his appointment should be limited to a period of three years, so that the Managers may then be free to consider their future policy.

At the meeting of the Institute of Metals held on September 23, the following nominations of officers for 1943-44 were announced: President: LIEUT.-COLONEL SIR JOHN GREENLY, K.C.M.G., C.B.E., M.A.; vice-presidents: DR. MAURICE COOK (Birmingham), COLONEL P. G. J. GUETERBOCK (Bristol), MR. A. J. MURPHY, M.Sc. (London); Members of Council: SIR CLIVE BAILLIEU, K.B.E., C.M.G. (London), MR. J. CARTLAND, M.C., M.Sc. (London), DR. A. G. C. GWYER (Warrington), DR. C. SYKES (Teddington).

#### Obituary

Mr. Bernhard S. Harlow, who died on September 26 at Cheadle Hulme, Cheshire, aged 74, was principal of Robert Harlow, Ltd., engineers, valve and cock manufacturers, and steam, air and hydraulic fitting makers, of Heaton Norris, Stockport.

DR. JAMES DARNELL GRANGER, Ph.D., F.I.C., M.I.Chem.E., who died recently at Winchester, aged 70, had for many years been chemist to the Chiswick Soap Company, interesting himself specially in the manufacture of polishes. In 1912-20 he was in Sydney, N.S.W., starting up and managing the Chiswick Polish Co. of Australia, and from 1929 until his retirement a few years ago, he was in charge of manufacturing operations in this country.

MR. ARTHUR ROBERT WARNES, F.I.C., A.Inst.P., M.I.Chem.E., who was especially well known as an authority on tar distillation, and served on the Council of the Institution of Chemical Engineers in 1923-27, died recently at the age of 65. Most of his career was spent as a consulting chemical engineer, but he had had much industrial experience also, both in this country and in India. He was, in addition, an authority on the restoration of the stonework of ancient buildings, and was frequently called into consultation on this subject.

MR. STANLEY BOURNE, who died at Epperstone Manor, Nottingham, on October 6, aged 67, was deputy chairman of Courtaulds, Ltd., and a director of British Cellophane, Ltd.

A colleague of the late R. H. VALLANCE, whose untimely death was recorded in our last issue, writes: "The passing of Mr. Vallance has been a great blow to us all. Not merely is so efficient and capable a colleague most difficult to replace, but we miss him personally. He was intensely popular, largely because of his even, kindly temper and his willingness, indeed eagerness, to help and do anyone and everyone a good turn. He was an important man in his village of Hampton, and his services there were probably as valuable to the community even as those to the scientific world. He was a splendid example of a truly human brilliant scientist."

#### Photography in Science Exhibition in London

A N exhibition, "Photography in Indus-November in the rooms of the Royal Photographic Society at 16 Prince's Gate, S.W.7, is being promoted by the Association of Scientific Workers. This exhibition will be opened by Sir Robert Watson Watt, F.R.S., under the chairmanship of Mr. D. McMaster (Pres. R.P.S.), on October 31, at 3 p.m.

The field covered by the exhibits will be wide and will have particular reference to the war effort, including work on machine movement analysis, radiography of castings, etc., mapping and surveying, mass examination for tuberculosis, crystallography, astronomy, nuclear physics, template making, etc. Many of the techniques illustrated will be applicable to the problems of chemical industry, and especially of metallurgy. Exhibitors include the Ministry of Information, technical branches of the three Services, individual technicians, and the large photographic firms.

## Parliamentary Topics Anti-Freeze Mixture

In the House of Commons last week, Mr. Brooke asked the Parliamentary Secretary to the Ministry of War Transport whether arrangements were being made to enable civilians, whose duties entitled them to a petrol allowance, to obtain anti-freeze for motor-car radiators this winter.

Mr. Noel-Baker replied that the supply of anti-freeze was so limited that it was only possible to make it available for private car users who could not conveniently take alternative measures for protection against frost. Such private car owners should apply to the local Regional Transport Commissioner.

#### General News-

The use of pure rice starch is prohibited for laundries and household purposes. A national blended starch is being manufactured to replace it.

Cigarette papers are being made from the jute derived from ancient sandbags, according to a statement by Brigadier G. E. Badcock, Director of Army Salvage.

Successful tests, on a small commercial scale, of an improved patent process for the manufacture of a carbonised fuel which has been certified as suitable for producer-gas plants, was announced by Lord Davies in his speech at the annual meeting of Ocean Coal and Wilson's, Ltd., last week.

Resolutions approving an increase of capital to £200,000 by the creation and issue of 950,000 additional shares of 2s. each were passed at an extraordinary general meeting of British Emulsifiers, Ltd., held in London on Wednesday. The purpose of the issue was the completion of the purchase of Aerlec (Aluminium), Ltd.

"The time has come for the State to recognise that science has cultural values," said Dr. R. H. Evans, in his inaugural address last week as chairman of the Yorkshire branch of the Institute of Civil Engineers. Scientists should be encouraged to participate in the control of national affairs for the benefit of the community.

The Polish Technological Association and the Czech Society of Engineers and Technologists recently announced in London their plans of co-operation, which involve the pooling of knowledge and resources. An immediate effect of the collaboration will be the exchange of experiences in industry, in the laboratory, and in warfare, to aid the united nations towards victory. It is further intended to use all influence to restrict German industrial power to the legitimate peaceful needs of the German state. It is hoped to organise the reconstruction of Polish and Czech industries as a counterpoise to German influence in Central Europe.

The Rt. Hon. Lord Portal, P.C., D.S.O., M.V.O., Minister of Works and Planning, will open the "Design for Economy—Paper in Battledress" exhibition sponsored by the Waste Paper Recovery Association, to be held in the Savoy Hotel, London, on October 13, at 11.30 a.m. The exhibition will remain open until 3 p.m., and will re-open on October 14 and 15 from 10 a.m. until 5 p.m. It is not open to the general public, but executives and others may be admitted upon presentation of their business cards, or invitations may be obtained upon application to the Waste Paper Recovery Association, 154 Fleet Street, E.C.4.

#### -From Week to Week

The following were elected members of the Manchester Chamber of Commerce at the Board meeting held on September 14: The Empire Charcoal Co., Ellesmere, Salop.; May and Baker, manufacturing chemists, 86 Cross Street, Manchester, 2.

Full particulars of the courses in advanced chemistry arranged for the coming session in Yorkshire may be obtained from the secretary of the Yorkshire Council for Further Education, Education Office, Calverley Street, Leeds, 1. In one respect these courses were wrongly described in our last issue. The second long course at Leeds is on Tuesdays and Thursdays, and started on September 29; this is a course in microbiology, the Tuesday lectures being for elementary students, the Thursday course for more advanced students.

The latest Bulletin (No. 6) issued by the Fuel Efficiency Committee is entitled "How to Make a Simple Steam Meter for Use in Factories"; its aim is to save fuel by accurate measurement of the quantity of steam raised by any boiler. Construction, installation, and method of use are described in detail; a table giving the necessary data for fixing dimensions and calculating results is included; and a complete set of working drawings is attached. This bulletin, like its predecessors, is distributed free to industry through the trade associations.

#### Foreign News

Exports of chemicals from Canada in May, 1942, were valued at \$8,215,000, compared with \$4,887,000 in May, 1941.

According to a new Reich decree, producer gas must take the place of petrol in almost all German lorries, stationary engines, and even marine engines.

Imports of chemical raw materials into Sweden in January-May, 1942, were 51 per cent. of the volume of similar imports in 1936-38, as against 57 per cent. last year.

Several Canadian Universities are planning courses in chemical warfare. Major I. M. Rabinowitch, of Montreal, has arranged the framework of lectures.

"Aralac," a casein fibre made from milk, which has been used increasingly in the U.S.A. during the past two years, may now be utilised in the making of many types of fabric.

It is understood that restrictions on lead will be eased by the United States War Production Board to encourage its substitution for scarcer metals, as reduced consumption and increased imports have built up a huge stock.

using to-

be

S.,

at

0-

of sh

Œ,

ur

Ir.

11.

we

elv

llv

er-

a

ces

m-

ld.

an

be to ine igs, inaohy, iakited emirgy.

ma-

Ser-

irge

Mr. ecreport e to hem eeze

only ear liter-rost. o the

Th

0

in

ch

di

an

or

to

Co

in

30

me

£2

tu

de

on

pre

1.8

A

pa

ha

the

ad

cer

an

Lt

cer

sha

ord

for

(14

for

N

1

COL

£1

Mr

Re

Mi

vat of che

pro

5

A new chemical manufacturing company, entitled Stormont Chemicals, Ltd., has been established by the Canadian Department of Munitions.

The use of benzol for any purpose in Canada, including its use in petrol for motor vehicles, is now prohibited, except by permit. The order is designed to direct all available benzol into the preparation of aviation petrol and synthetic rubber.

Carbon tetrachloride, trichlorethylene, and tetrachlorethylene are now admitted free of duty into Southern Rhodesia, if of British or Dominion origin. A 5 per cent. ad ralorem duty is imposed on material of foreign origin.

A search for the lost secrets of the ancient Irish dyes has been instituted in Eire. A number of vegetable dyes have recently been tried with some success, but the only native dye extensively used at the present time is "crotal"—a heather-brown dye derived from a rock lichen.

Krefeld, which was heavily bombed by the R.A.F. last week, though mainly known for its silk and artificial silk factories, has also some important chemical works of the I.G., manufacturing acetylene, compressed gases, and welding apparatus. Details of the effect of the raid on these works have not yet been published.

#### Forthcoming Events

The Chemical Society (Leeds Area Section) will hold a meeting in the Chemistry Lecture Theatre, Leeds University, on October 12, at 6.30 p.m., to hear Dr. F. Fairbrother speak on "Radioactive Isotopic Indicators."

The Institute of Physics is holding a discussion on "Education and Training of Physicists," at the Royal Institution, Albemarle Street, London, on October 12. At the morning session (10.30 a.m.—12.30 p.m.) "The Education of the Physicist" will be discussed, and in the afternoon (2 p.m.—4 p.m.) the subject will be "Training for Research in Industrial and Applied Physics."

The London Section of the Institution of Rubber Industry will hold a meeting at the Caxton Hall. Westminster, S.W.I., at 6,30 p.m., on October 12. "The Behaviour of White Factice in Latex" will be discussed by Mr. F. S. Roberts, A.I.R.I., after which Mr. H. J. Lanning, B.Sc., A.I.C., A.R.C.S., A.I.R.I., will speak on "The Effect of Varying Percentages of Vulcanising Ingredients in Factice containing Mixes."

The opening meeting of the 1942-43 Session of the Chemical Engineering Group (Society of Chemical Industry) and the Institution of Chemical Engineers will be held jointly on October 13, at 2.30 p.m., in the rooms of the Geological Society, Burlington House,

London, W.1, when a paper on "The Production of Radium" will be presented by E. F. Mactaggart, B.Sc., A.R.C.S., A.M.I. Chem.E.

The opening meeting this session of the Institute of Fuel will be held on October 13, at 2.30 p.m., in the Lecture Theatre of the Institution of Electrical Engineers, Victoria Embankment, London, W.C.2, when the president, Mr. W. M. Selvey, will present a short address. The Melchett Lecture, entitled "The Analysis and Testing of Coal in Relation to its Properties and Utilisation," will be delivered in the form of a talking film.

A meeting of the **Food Group** of the Society of Chemical Industry will be held in the rooms of the Chemical Society, Burlington House, on **October 14**, at 2.15 p.m. The following papers will be presented: "Vitamin Content of Certain Vegetables," by Dr. M. Pyke; "New Beer Disease Organisms," by A. J. C. Cosbie; "Location of Vitamin B in Wheat," by A. H. Ward,

The Edinburgh and E. Scotland Sections of the Society of Chemical Industry will hear Dr. Gee, of the British Rubber Producers' Research Association, lecture on "The Fundamental Factors Governing Oil Absorption by Rubber," on October 16, at the North British Station Hotel, Edinburgh.

The Association of Scientific Workers announces a conference on "Science for Victory," at the Royal Hotel, Cardiff, on October 18, (10 a.m.—1 p.m. and 2.15—5.15 p.m.), to demonstrate to the people of South Wales the necessity of scientific control and planning in all aspects of industry and life for the speedier winning of the war. Tickets, price 1s., from the Conference Secretary, 130 Cardiff Road, Llandaff, Glam,

The Institute of Chemistry (London and S.E. Counties Section) will meet at 30 Russell Square, on October 21, at 4 p.m., when Mr. G. Smith, M.Sc., A.I.C., will present a paper on "Moulds and their Industrial Application."

There will be a meeting of the London and South-Eastern Section of the Institute of Chemistry, at the Institute of Chemistry, Russell Square, on October 21, at 4 p.m., when Mr. G. Smith, M.Sc., A.I.C., will speak on "Moulds and their Industrial Application."

The annual general meeting of the **British**Standards Institution will be held at the
Institution of Mechanical Engineers, St.
James's Park, London, on October 22, at
12.15 p.m.

The inaugural meeting of the Tees-Side Section of the Institute of Chemistry has been arranged for October 22, when Dr. J. J. Fox, president of the Institute of Chemistry, will speak on "Policy and Future of the Professional Chemist."

0-

VC

I.

he

3,

he

ia

he

a

n-

in

ng

ty

he

on

he

in

M.

." B

ns

ear

he

rp-

rth

an-

for

on .15

ith

nd

life

its.

ry,

and

30

m.,

rial

and

of

m.,

rial

tish

the St.

has . J. try,

the

rs

#### Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for errors that may occur.

#### Order Made on Application for Discharge

WHITE, CHARLES ALFRED, 1 Turpington Lane, Bromley, Kent, perfumery manufacturer. (O.M.A.D., 10/10/42.) Discharge suspended for six months. Bankrupt discharged as from February 25, 1943.

#### Company News

British Portland Cement Manufacturers' announce that the interim dividend on the ordinary stock is to be kept at 5 per cent.

Tarfroid (1931), Ltd., Abford House, Wilton Road, Victoria, S.W.I., have changed their name to Thames Tar Products and Contractors, Ltd.

Contractors, Ltd.

Lovering China Clays, Ltd., are paying interest on 6 per cent. debentures of 1½ per cent. actual for the half-year to September 30, 1941, plus one year's interest thereon.

30, 1941, plus one year's interest thereon. Profits announced by International Bitumen Emulsions, Ltd., for the past year, were £29,356, against £18,968. The dividend is 6 per cent., as already announced.

Associated Portland Cement Manufacturers, Ltd., have declared an interim dividend of 2½ per cent. on ordinary stock (same) on account of 1942.

Wm. Neill and Son, Ltd., announce a profit, for the year ended March 31, of £89,388, before taxation (last year, £66,709). A final dividend of 3\{\}d. per 2s. share is being paid, making 20 5/6 per cent. (same).

Pest Control, Ltd., Hauxton, Cambridge, have increased their nominal capital beyond the registered capital of £10,000, by the addition of £10,000, divided into 9100 8 per cent. cumulative preference (non-redeemable) and 900 ordinary shares of £1 each.

The Electrolytic Zinc Co. of Australasia, Ltd., announce a final dividend of 5 per cent. on the preference and old ordinary shares, and of 3\mathbb{3} per cent. on the new ordinary shares, making a total distribution, for the year ended June 30, of 9 per cent. (14 per cent.) for the first, and 4\mathbb{3} per cent. for the second.

#### New Companies Registered

Perus Products, Ltd. (376,364),—Private company. Capital: £1000 in 1000 shares of £1 each. Manufacturing, research, analytical and dispensing chemists, etc. Subscribers: Mrs. M. E. Beech and Richard C. Beech. Registered office: 190 High Road, Wembley, Middlesex.

Sentinel Products, Ltd. (376,108).—Private company. Capital: £500 in 500 shares of £1 cach. Manufacturers of and dealers in chemicals, drugs, disinfectants, colours, dyes, proprietary articles, etc. Directors: L. Prespective.

man, Sarah Rubens. Registered office: 1 Bristol House, Southampton Row, W.C.1.

H. M. Langton and Company, Ltd. (376,320).—Private company. Capital: £500 in 500 shares of £1 each. Manufacturers of and dealers in chemicals, dyes, drugs, essences, fertilisers, paints, varnishes, etc. Harold M. Langton is the first director. Solicitors: Warren and Warren, 31 Bedford Row, W.C.I.

Peerless Chemical Laboratories, Ltd. (376,213).—Private company. Capital: £500 in 500 shares of £1 each. Manufacturers of and dealers in chemicals, drugs, disinfectants, fertilisers, oils, colours, glues, varnishes, polishes, laboratory reagents, etc. Harry Morser is the first director. Registered office: 40-42 Oxford Street, W.1.

Engineers' Waste Washing Company, Ltd. (676,267).—Private company, Capital: £1000 in 1000 shares of £1 each. Washers and cleaners of rags and other articles used in or connected with the engineering, chemical and allied trades, dealers in animal by-products and offal, etc. Directors: Elkan Teller, Winifred D. Luxford, Registered office: Vale Road, Tonbridge, Kent.

Solo Laboratories, Ltd. (376,304).—Private company. Capital: £1000 in 1000 shares of £1 each. Manufacturers of and dealers in chemicals, drugs, soap, disinfectants, oils, polishes, colours, laboratory reagents, thermometers, X-ray tubes, optical and scientific instruments, etc. Vivian F. Frank, C.A., Melton House, Harrow-on-the Hill, is the first director and secretary.

Warings Melalbro, Ltd. (376,202).—Private company. Capital: £500 in 500 shares of £1 each. Chemists' sundriesmen, chemical engineers, sterilisers, dyers, cleaners, makers of chemical plant and materials, laboratory proprietors, charcoal manufacturers, metallurgists, etc. Benjamin Ladd is the first director. Registered office: 61 Paget Street. Cardiff.

## Chemical and Allied Stocks and Shares

BUSINESS in the industrial and kindred sections of the Stock Exchange showed further expansion and an upward trend in values, but there was no appreciable increase of activity in front rank investment securities, although a firm undertone has been maintained in British Funds. Imperial Chemical rose further from 33s. 9d. to 34s. 9d., it being pointed out that on the basis of last year's 8 per cent. dividend the yield still compares favourably with the return on other leading industrial shares at current prices. At 30s. 6d. Lever & Unilever were slightly higher on further consideration of the results and annual statement, while Bradford Dyers ordinary rose further to 14s. and the preference units to

17s, 3d, there being hopes that payment of the balance of arrears of preference dividend may shortly be announced.

Borax Consolidated have further improved to 34s. 6d. which compares with 33s. 9d. a week ago, maintenance of the 71 per cent, dividend rate being generally expected for the financial year ended last month. British Match had a firm appearance at 37s, 3d, and many other shares of companies connected with the chemical and kindred industries participated in the general upward movement in Stock Exchange values, including Brifish Aluminium, which were 47s. 9d. compared with 45s. 9d. a week ago, and British Oxygen, which were 72s, compared with 65s. 6d. The rise in values reflects absence of selling as much as increased demand; in fact, many stocks and shares have again been only in small supply in the market, the higher prices having induced very little profit-taking. It is realised, however, that during the past two weeks the upward movement has been substantial, and that market sentiment must be expected to be influenced from time to time by the nature of the war news. Moreover, no general improvement in dividend payments can be expected under existing conditions, and in some cases, yields on industrial shares are now not appreciably higher than these on British Funds. Consequently, it is not unlikely that before long there may be a renewed rise in the latter and in lead-

ing investment securities generally.
United Molasses have further improved from 29s, 9d, to 30s, 9d, general expectations being that the forthcoming interim dividend will be maintained. The units of the Distillers Co. were 81s, 6d, as compared with 79s. 6d. a week ago, and among other leading industrials, Turner & Newall have risen on balance from 69s, 6d. to 73s, 6d. Erinoid were unchanged at 10s, 3d, xd, on the maintenance of the dividend at 10 per cent., it being expected that the full results will show that profits are being distributed in a conservative manner, Wall Paper Manufacturers deferred units were maintained at 29s, awaiting the financial results. W. J. Bush changed hands at the higher level of 48s. and elsewhere, Greeff Chemicals 5s. units were around 5s. 9d. Lawes Chemicals were 8s. 9d. while Fison Packard trans ferred at 38s. 6d. at one time, and the shares of the Valor Co. at 37s. 3d. B. Laporte remained around 70s. and Cellon 5s. ordinary were quoted at 16s. 3d., while British Glues 4s. ordinary were 6s. 6d., but the shares were firmly held and in these cases it appeared doubtful if quotations were adequately tested by business. In advance of the chairman's annual statement, which has been awaited with interest for comments on the lower earnings shown by the results, Triplex Glass showed improvement to 30s. 71d. Barry & Staines have further improved from 36s. 3d. to 37s. 6d., and Nairn & Greenwich were again 55s.

Iron, steel and allied shares participated in the upward movement, Guest Keen being 27s., United Steel 24s., Stewarts & Lloyds 50s., and Tube Investments 88s. 6d. Monsanto Chemicals 5½ per cent. preference were again 22s. 6d. and elsewhere, British Drug Houses maintained their recent rise to 20s. Boots Drug were 38s, 3d. and Sangers were 17s. 10½d. while in other directions, Goodlass Wall again changed hands around 12s. British Plaster Board rose from 25s, 9d. to 26s. 3d. "Shell," Anglo-Iranian, and most other oil shares were higher on balance for the week.

## British Chemical Prices Market Reports

STEADY inquiry is reported from most A STEADY inquiry is reported from most sections of the industrial chemicals market, buying interest covering both spot and forward delivery dates, and so far as existing contracts are concerned deliveries have been made on a satisfactory basis. The supply conditions show no material alteration and generally speaking spot offers are finding a ready outlet. In the soda products section yellow prussiate of soda is in strong request with limited supplies available, and there is a steady call for chlorate of soda and nitrate of soda. Among the potash products permanganate is an active item, and there is a ready market for available parcels of caustic potash, bichromate of potash, and yellow prussiate of potash. In other directions steady sales are reported in red and white leads and the zinc oxides. Elsewhere the supply position of citric and tartaric acids is reported to be easier. Conditions in the coal-tar products market remain about the same although a slight increase in activity is noted in the case of pitch. The toluols and benzols are a good market.

Manchester.—General firm price conditions in respect of heavy chemicals has been reported on the Manchester market during the past week. Most of the soda compounds are meeting with a good demand so far as the movement of contract supplies is concerned, and there is a fair inquiry about for ammonia and magnesia products, while offers of all descriptions of potash chemicals are being promptly taken up. The majority of the acids are also a satisfactory market. In a few instances stocks of the by-products tend to increase somewhat, but for the most part business in these is on steady lines.

GLASGOW.—In the Scottish heavy chemical trade there was a slight improvement during the past week for home business. Export inquiries and trade were rather limited. Prices remain very firm at about previous levels. In a few instances there has been a slight advance.

ed ng ds

ce sh

ds

la-

ere

ost

pot as

ries

The

are acts

ong and soda tash tem, able

In d in

ides. and Con-

re.

in-

e of

good

con-

heen

iring

ands

con-

about

while

nicals

jority

rket.

most

mical

aring

nited. evious een a

## J. M. STEEL & Co., Ltd.

Acidproof Cements
Antioxidants
Asplit Impervious Cement
Barytes Substitute
Carbonate of Potash
Caustic Potash (all grades)
Cellulose Adhesives
Chlorinated Rubber
Cryolite (Synthetic)

Dehydrated Castor Oil
Diammoniumphosphate
Ethyl Cellulose
French Chalk
Luminant Pigments
Manganese Borate
Methyl Cellulose
Methylene Chloride
Oxalic Acid and Salts

Plasticisers
Potassium Bichromate
Preservatives for Glues, etc.
Resins (synthetic)
Rubber Accelerators
Sodium Acetate
Sodium Bichromate
Sodium Chlorate
Sodium Nitrate

Sodium Nitrite
Sodium Sulphate desiccated
Solvents
Strontium Salts
Synthetic Glues
Talc
Thio Urea
Urea
Zinc Chloride. Etc., etc.

Head Office : "Kern House," 36/38, Kingsway, LONDON, W.C.2 Branch Office : Calder St., Lower Mosley St., MANCHESTER

Holborn 2532-3-4-5

Telephones:

Central 0524



## 'ANALAR' CHEMICALS

- They are of British Manufacture
- They conform to published standards of purity
- They are supplied under labels showing maximum limits of all likely impurities
- They are bottled under conditions which ensure freedom from contamination
- They are so pure that 'reagent errors' are eliminated

'AnalaR' laboratory chemicals are essentially intended for use as the standard analytical materials in laboratories where important and responsible work is undertaken. The approval accorded to them indicates the confidence with which the name is regarded in its relation to reagents of known, precise and accepted standards.

The 'ANALAR' specifications are set out in the publication "ANALAR STANDARDS FOR LABORATORY CHEMICALS."

THE BRITISH DRUG HOUSES LTD.
GRAHAM STREET LONDON N.I

T

PI

FL

Le

Du

tra

Jos

mo

Jon 328

1

r

t

a

## BRITISH ASSOCIATION OF CHEMISTS

Unemployment Insurance, total funds over £27,000 Legal Aid. Income Tax Advice. Appointments Service.

Write for particulars to :-

C. B. WOODLEY, C.R.A., F.C.I.S., General Secretary, B.A.C. "Empire House," 175, Piccadilly, London, W.I

Phone: REGENT 6611

#### CLASSIFIED SECTION

NOTE Trade announcements, other than strictly second-hand and job lines, cannot be inserted in these pages except by firms whose advertisements run in the display columns.

#### **EDUCATIONAL**

Great Possibilities for QUALIFIED CHEMICAL ENGINEERS Key Men in Wartime and Afterwards. Many of the finest posts in Britain in Wartime are reserved for Chemical Engineers. The same will be the case when the war is over. The vast technique and experience now being applied to Chemical Technology for war purposes will then be suitably utilised in reconstruction, and in trade and commerce.

Enrol with the T.I.G.B. for the A.M.I. Chem. E. Examinations in which homestudy Students of The T.I.G.B. have gained:—

TWO "MACNAB" PRIZES.
Write to-day for "The Engineer's Guide to Success"—free, containing the world's widest choice of Engineering Courses—over 200—the Department of Chemical Technology including Chemical Engineering Processes, Plant Construction, Works Design and Operation, and Organisation and Management—and which alone gives the Regulations for A.M.I.Chem.E., A.M.I. Mech.E., A.M.I.E.E. C. & G. B.Sc., etc.
THE TECHNOLOGICAL INSTITUTE

THE TECHNOLOGICAL INSTITUTE OF GREAT BRITAIN, 219 Temple Bar House, London, E.C.4.

#### FOR SALE

100 REBUILT Hydro Extractors by all leading makers from 18 in. upwards with countershafts attached and safety covers. Jacketed Steam Pans, various sizes. List on request, Seen at Randalls, Arundel Terrace, Barnes. Telephone: Riverside 2436.

1000 STRONG NEW WATERvalue 5s. each. Clearing at 30s. dozen. Also large quantity Filter Cloths, cheap. Wilsons, Springfield Mills, Preston, Lancs. Phone 2198.

Second-hand

#### LEAD LINED TANKS

for sale.

EAD LINED OPEN TANK, 10 ft, by 10 ft, by 12 ft, 6 in, deep at sides and 13 ft, 6 in, deep in centre, sides being carried down to the full 13 ft, 6 in, deep; 5/16 in, plate; each side having three 6 in, by 5 in, R.S.J. strengthening beams, each 15 ft, 6 in, long riveted vertically to sides; stay bolts across top; lined with \(\frac{1}{4}\) in, thick lead stayed to sides of tank; also fitted with approx. 70 ft, of 2 in, dia, lead coil; capacity approx. 8,000 galls.

FIVE—practically new OUSLY LEAD LINED TANKS, each 13 ft. 10 in, long by 5 ft. 10 in, wide by 2 ft. deep, ½ in. M.S. plate, with 4 in. and 5 in, dia. outlets; hand operated screw-down stopper to outlet. Drawing available.

GEORGE COHEN, SONS & CO., LTD., QUADRANT STREET, CANNING TOWN, LONDON E.16, and STANNINGLEY, near LEEDS.

H YDRAULIC TUBING, 1 in., large quantity, secondhand, new condition, also limited quantities other sizes and fittings. Hydraulic Valves, new, various types against requirements. Thompson & Son (Millwall), Ltd., Cuba Street, Millwall, London, E.14. East 1844.—

CHARCOAL, ANIMAL, and VEGEing, disinfecting, medicinal, insulating; also lumps ground and granulated; established 1830; contractors to H.M. Government.—Thos. HILL-JONES, LTD., "Invicta" Mills, Bow Common Lane, London, E. Telegrams, "Hill-Jones, Bochurch, London." Telephone: 3285 East.

'Phone 98 Staines,

JACKETED Steel Mixer 24 in. by 18 in.
by 16 in.: Copper Jacketed Caramel
Mixer: Vertical Gas Fired Boiler 6 ft. by
3 ft.: Kestner Single Effect Evaporator.

HARRY H. GARDAM & CO., LTD., STAINES. R

8

so

p.

CR.

by

and

ing in.

ing

ented 088

yed rox.

eity

NE.

ach

by in.

ated aw-

D., WY.

arge

tion, l fit-

rious n & Mill-

EGE-

ilter. ting:

stab-

vernicta"

Telelon."

18 in.

ramel

ft. by

or.

D.,

3 Gallon Earthenware Jars for sale, large quantity. Guxn, Whitepost Farm, London Road, Rayleigh, Essex

ARGE quantities clean ground salt cake regularly available. Low prices for regular outlets. Please reply to Box No. 2084. THE CHEMICAL AGE, 154 Fleet Street, E.C.4.

#### WANTED

WANTED, back numbers of THE CHEMI-CAL AGE as follows:—

1941, March 15th.

1941, October 24th,

1941, November 1st, 15th, 22nd and 29th. 1941, December 20th. 1942, February 7th and 21st. Please reply to THE CHEMICAL AGE, 154 Fleet Street, London, E.C.4.

WANTED.—Small Agate Mortar and Pestle by Laboratory Supplies & Lennox Chemicals, Ltd., 3 Leinster Street,

#### SERVICING

GRINDING of every description of chemical and other materials for the trade with improved mills .- Thos. HILL-Jones, London, E. Telegrams: "Hill-Jones, Bochurch, London." Telephone: 3285 East.

The fact that goods made of raw materials in short supply owing to war conditions are advertised in this paper should not be taken as an indication that they are necessarily available for export.

#### AUCTIONEERS, VALUERS, Etc.

DWARD RUSHTON, SON AND KENYON (Established 1855).

Auctioneers' Valuers and Fire Loss Assessors of CHEMICAL WORKS, PLANT AND

MACHINERY. York House, 12 York Street, Manchester.

Telephone: 1937 (2 lines) Central, Manchester. Telegrams: "Russoken," Manchester.

WE WOULD REMIND ADVERTISERS THAT "COPY" FOR DISPLAY AD-**VERTISEMENTS** SHOULD REACH THIS OFFICE NOT LATER THAN FRIDAY PRECEDING WEEK OF **PUBLICATION** 

# ACTIVATED **ALUMINA**

(BRITISH MANUFACTURE)

of high adsorptive efficiency, for dehydration of gases and liquids.oil refining and air conditioning, and as an effective catalytic agent for many chemical reactions...

ALL ENQUIRIES TO:-PETER SPENCE & SONS LTD NATIONAL BUILDINGS . MANCHESTER 3

#### CHEMICAL LEADWORK

TANKS - VATS - COILS - PIPEWORK

W. G. JENKINSON, Ltd. Telephone 22473 156-160, ARUNDEL STREET, SHEFFIELD

#### TRIBASIC PHOSPHATE OF SODA

Free Running White Powder

Price and sample on application to :

PERRY & HOPE, LIMITED, Nitshill, Glasgow

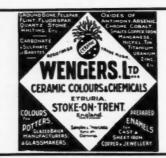
#### "LION BRAND" METALS AND ALLOYS

MINERALS AND ORES RUTILE, ILMENITE, ZIRCON, MONAZITE, MANGANESE, Etc.

BLACKWELL'S METALLURGICAL WORKS LTD.

GARSTON, LIVERPOOL, 19

ESTABLISHED 1869





## Downs Engineering Works

Manufacturers of
LIQUID FILLING MACHINES
For Barrels, Cans and Drums
BARREL WASHING MACHINES
AFETY ELECTRIC HAND LAMPS
& TORCHES
BARREL & CAN INSPECTION
TORCHES

VACUUM & PRESSURE RELIEF

For Spirit Storage Tanks

Send for illustrated lists
Southfield Road, Acton, London, W.4

PUREST AND FINEST Highest Percentage of Tricalcic Phosphate

CAFFERATA & CO..LTD. BEACON HILL, NEWARK, ENG.

LARGE DEPT. FOR TECHNICAL BOOKS



New and secondhand Books on all branches of Science and every other subject. Stock of nearly three million Catalogues free

BOOKS BOUGHT

119-125 Charing Cross Road, London, W.C.2
TELEPHONE: GERRARD 5660 (16 lines) Open 9-6 (including Saturday)











Industrial
Y" SAFETY
EQUIPMENT



RESPIRATORS AND GAS MASKS GLOVES FOR EVERY INDUSTRIAL REQUIREMENT - GOGGLES, SPEC-TACLES AND WELDING SHIELDS

Saftey Belts and Hoisting Apparatus. Grinding Machine and Shafting Guards. Asbestos Clothing for Fire Protection. Stretchers and First Aid Equipment.

Write to-day for a copy of our "Blue Book for Safety Appliances"—the result of fifty years' experience in protecting industry.

### WALLACH

TABERNACLE ST : LONDON : E-C

#### -CALLOW ROCK-

High-Calcium

# LIME

for all purposes

QUICKLIME

(Calcium Oxide)

of the highest commercial quality in lumps or in coarse powder form

HYDRATED LIME

(Calcium Hydroxide)

in Standard and Superfine grades to meet most industrial requirements.

• • •

The Callow Rock Lime Co. Ltd. CHEDDAR, Somerset.

London Agents: W. K. CHANDLER & CO., 4, LLOYDS AVENUE, E.C.3

## Audco-Heresite "Covers" EVERYTHING



where it is possible to apply a continuous surface

All details of the Rail Tank illustrated were fully protected against acidaction of contents by Audco-Heresite Baking enamel—applied not only as Tank lining, but also to manhole cover, needle valve, shaft and branch outlets.

Let us send you particulars of this efficient, economical method of protecting metal against acids and alkalines.



Belt-Driven

### JACKSON-CROCKATT (PATENT)



No. 3 Motor-Driven We also manufacture

FILLING and PACKING MACHINES

#### J. G. JACKSON & CROCKATT LTD.

Belt-Driven

DARNLEY STREET GLASGOW, S.I.



